THE
ELECTRICAL REVIEW.

VOL. LVII. OCTOBER 6, 1905. No. 1,454.

ELECTRICAL REVIEW.

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THE EXHIBITION.

FOR those who take an active interest in the electrical industry—and especially those who are engaged in the neighbourhood of the metropolis—there is one ruling topic just now, and that topic may be summed up in the one word Exhibition. Olympia has proved to be a success already, a success, we believe, quite beyond the imagination of those in whose minds the idea first had birth; indeed, in the flush of early enthusiasm during the latter days of last week there was a rumour—only a wish perhaps—about a possible postponement of the closing date beyond the 21st. That, however, we understand to be an impossibility, because the premises will be needed immediately after the Electrical Exhibition is closed, for preparations to be made for the show which is to follow it. But even were it possible we do not consider that it would be desirable.

A point upon which we have heard decided opinions expressed, is that the daily opening and closing times are both too early. It has been represented to us that many visitors whose presence is desirable from a business point of view, proceed to Olympia after dinner, and arrive too late in the evening to enable a thorough examination of the more popular exhibits which appeal to them, and for which they are potential customers, to be made before 10 o'clock—the official closing time. Here, again, the management asserts that is impossible to make any alteration, so the situation must be accepted, though with considerable regret in some cases.

The Olympian Exhibition is not appealing merely to thousands and tens of thousands of sight-seers. It *is* doing that, and doing it well, and its influence will remain for a long time to come, bringing much benefit to the electrical industry. But it is also playing the very important part of being a great educational object-lesson for the electric lighting engineers, their assistants and their municipal committees, who have been coming from all parts of the United Kingdom to learn whatever there is to be learned at Olympia, to aid them in popularising their own systems of supply with the private lighting and power consumer.

The ELECTRICAL REVIEW has made a modest attempt to keep the exhibitors advised as to the dates upon which these engineers and committee deputations expected to be present. We are amply repaid for this by the expressions of appreciation which have been showered upon us from various directions. For the benefit of the very wide circle of readers who are not exhibitors, we give on another page a list of some further visits of this description which are to be made during the remaining weeks of the Exhibition. In thanking those engineers who have so kindly assisted us in the compilation of this information, we should like to suggest to others who have not received our applications that they should drop us a card saying when they will be coming, so that we may make our later lists as complete and valuable as possible.

Our own impression thus far has been that Olympia is as important just now for seeing men as for seeing things. Opportunities have been afforded to many trade and manufacturing representatives to get into close touch with just the very men they want to meet, those whom at other times they experience some difficulty in locating. And when this sort of thing occurs, it means that business is proceeding satisfactorily. Indeed, there are various indications that British electrical manufacturing and trade in general are awakening, and that times of greater prosperity are at hand. We hope we do not read the signs incorrectly.

There has been a good deal of journalistic trash appearing in the newspaper Press relating to the show; that was, we suppose, to be expected. One writer glorifies the motor-car industry at the expense of the electrical, purely because he finds that our great industry has not filled every available foot of space at Olympia; he ignores altogether the fact that the show is not, and never was intended to be, representative of heavy electrical engineering. A glance at the catalogue, and a consideration of the names of important manufacturing firms who are not in evidence, would be sufficient information for anyone who wished to have a proper knowledge. To be able to write a criticism of any matter for the daily Press seems to require merely a half-knowledge of the facts, and a gift of laying on exaggerated fancy-talk calculated to tickle the reader. In another paper a correspondent has suggested that the capabilities of electricity as a humane means for electrocuting cattle should be demonstrated in actual practice! But we suppose we must not be too severe on those who are helping to draw the public to Olympia—for after all that is the great thing required, to get the people there. The Exhibition will do the rest.

We have a complaint to make with somebody—we do not know exactly whom, unless it be the management and the Hammersmith Borough Council electricity department. On Monday there was to have been an interesting demonstration of electric heating and cooking in the specially-equipped kitchen. This department of electricity is in need of all the encouragement that this or any other exhibition could give it, but it will receive no impetus whatever from a demonstration, which is no demonstration at all except of failure. And it was a failure, not through any fault of the actual apparatus on show, but purely because when the event was due there was no current available for the purpose. This is not the only complaint that has been made about the supply of electricity in the Exhibition building.

Technical Classes.

A MEMORANDUM has been issued by the Board of Education to the Inspectors of Technical Institutions, referring to the advantages accruing from co-operation between employers of labour and the managers of technical institutes, with regard to the instruction of employés and apprentices. We called attention some time ago to the action of the North-East Coast Institution of Engineers and Shipbuilders, the Council of which is fairly representative of the shipbuilding and engineering employers, towards technical training; and the memorandum referred to above would appear to have been inspired by the results of the co-operation existing in the North between educational authorities and employers of labour. It is pointed out that the interest taken by employers or foremen in the technical studies of apprentices may, and generally does, exercise an important influence in helping these youths to appreciate the value to them of technical education. The methods in which employers can co-operate with teaching authorities are enumerated, and these are:—(1) In assisting with the class fees or the giving of prizes. (2) By increase in wages. (3) By allowing time for attendance at class. (4) By providing scholarships for specially qualified students. (5) Supervision. That is, keeping under observation the curriculum of the local technical institutes and offering suggestions with a view to bringing the instruction into line with the special requirements of the industries.

From the apprentices point of view, no doubt, the increase in wages is the one which appeals more directly to them. In certain cases where apprentices have passed successfully through a course of study approved by the employer they become entitled to a rise in wages which would otherwise not be due. In other cases encouragement is offered by giving preference for more remunerative posts to employés, who, by taking advantage of technical classes show increased efficiency. The time allowed from work for attendance at classes is also a very important and valuable consideration. A youth who has to rush off from the workshop and proceed direct to his class, which may be at some distance, is handicapped considerably as compared with one who can go home and obtain change of clothes and a substantial meal before proceeding to his class. An hour's allowance on a class night is, therefore, a considerable advantage to an apprentice. Another form of remission of time takes the shape of "writing off" part of the apprenticeship course. In this way the apprenticeship of a good student may be reduced by as much as one year. It is a very satisfactory sign that employers generally are beginning to recognise the value of technical education, as not only do they help to raise the intellectual standard of workmen, but their practical interest in educational matters tends also to improve the character of the technical teaching generally, by bringing it more into line with actual requirements and rendering it less academic in character.

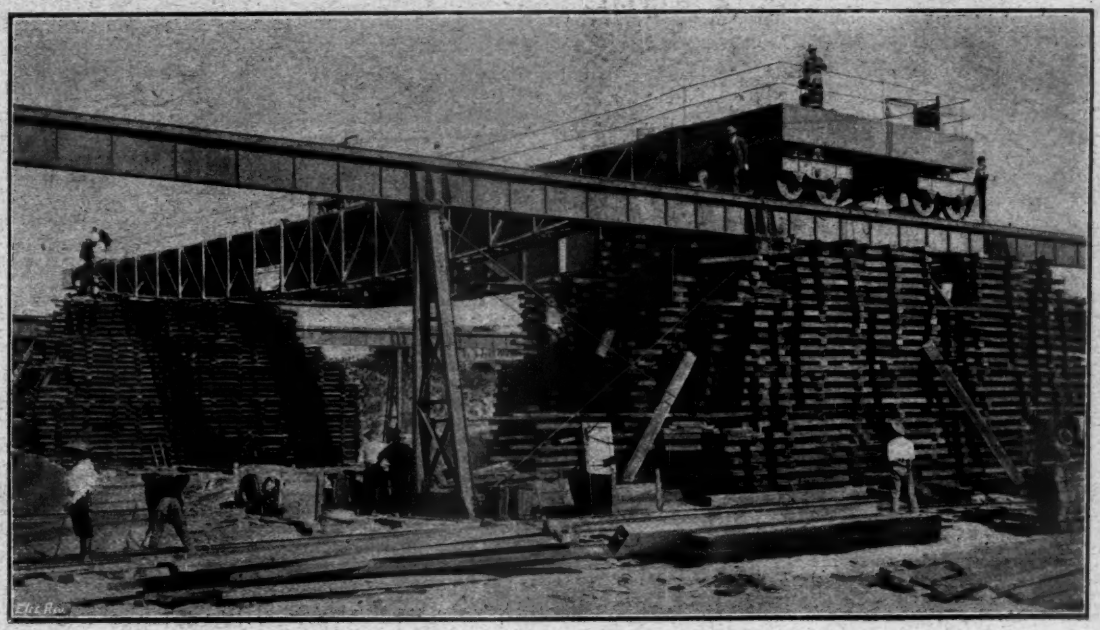
Electrical Imports of India.

WE are glad to announce—on unimpeachable authority—that "instructions have been issued to Customs officers for the separate enumeration of imports of electrical machinery in the returns of the sea-borne trade" of British India. In our issue of June 2nd last we drew special attention to this omission and urged its remedy. This new departure, if the headings under which the information is collected are well chosen, will enable the student of Indian Blue-Books to state definitely the extent of German and American competition in various branches of electrical trade as measured in India. Hitherto, the only indices of this trade were the respective values of the goods exported at their British, German or American port of shipment, a sum whose competitive value was liable to modification by reason of freight charges. This increased recognition of the value of electricity in our Eastern Empire is certainly welcome. We should like to express a hope that now that the reform asked for has been conceded, information should be collected in as valuable a form as possible. Two main headings, electrical machinery and electrical fittings, would be good, but the sub-divisions which we publish once a month of the electrical exports of the United Kingdom would afford a much better system of enumeration. The Government of India possesses a high repute for the minute details which its statisticians enumerate. We have already alluded to the computations of the value of corks imported, but the Indian railway returns are even more exhaustive, the net of official information securing for preservation such facts as the carriage of five tons of ginger on the Bengal Central Railway in return for a payment of 26 rupees. The system of classification of electrical imports, which we suggest for adoption, will have to deal with large items, and cannot, therefore, be dismissed as affording too many sub-headings to be of value.

NATAL HARBOUR BOARD DEVELOPMENTS.

[By our Durban Correspondent.]

The adoption of electric cranes to replace the present hydraulic ones at Durban has often been discussed, and we are pleased to note that a start has been made.

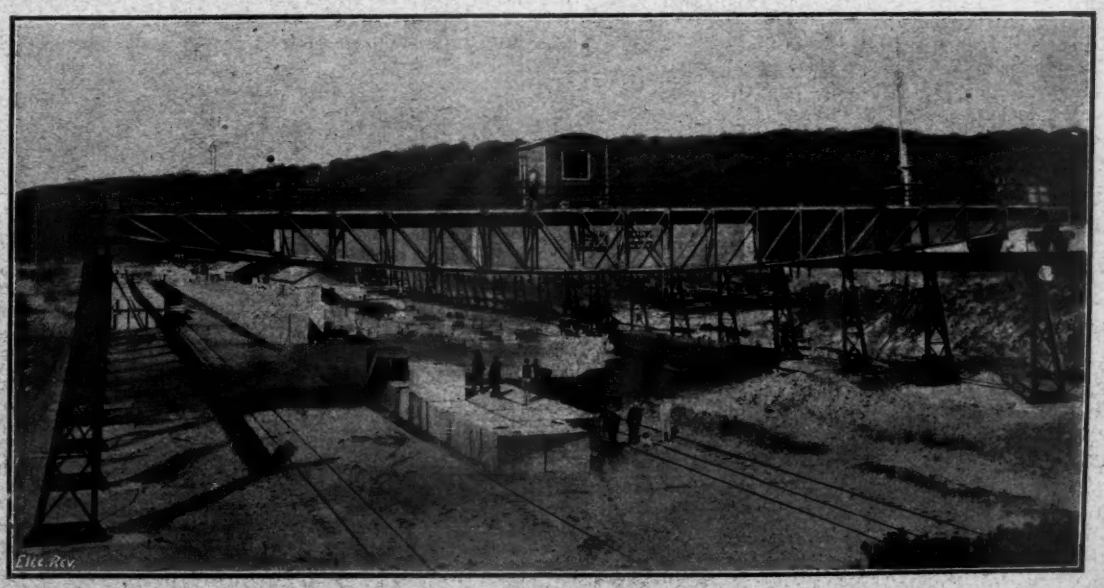


Large Electric Crane at Durban, Showing Staging.

The present mammoth crane was the subject of much interest to those present at its inauguration on August 29th. The crane is used in connection with the concrete block building yard, for the purpose of lifting and transporting the huge concrete blocks used in the construction of the Quay Walls, the power being supplied from the Harbour Board power station at 500 volts. The crane is one of the largest of its type in the world; the materials were made by Messrs. Stothert & Pitt, engineers, of Bath, and the electrical equipment was supplied by Messrs. Bruce Peebles & Co., Ltd.

Briefly, the details are as follows:—It has a longitudinal travel of 1,435 ft., the width of the span is 135 ft., and it lifts 20 tons at the rate of 10 ft. per minute. The traveller that runs on the top of the gantry weighs over 90 tons, and it is equipped with four series of reversing motors working at 500 volts.

They are of the ventilated type, specially designed for crane work. Carbon brushes are used on the motors, which do not require to be moved for any variations in the load up to the maximum, and there is no sparking. The resistance on the hoisting motor is of the "flat ribbon" type, on the cross traverse and longitudinal travel of the "squirrel" type, the controllers are of the "tramway" type, and the bearings of the motors are lubricated by means of oil rings. The insulated cables are lead-covered, and current is conveyed to the traveller by means of a collector at one end, which runs on



Electric Gantry Crane Completed.

two trolley wires supported from brackets fixed to the inside of the gantry immediately under the rail. All the gear wheels are cut; the hoisting motor is 20 B.H.P., and the cross traverse motor 12 B.H.P. Two 40-B.H.P. motors are mounted one on each end of the traveller for the longitudinal travel. These motors are so arranged that they will give six speeds of travel from 100 ft. to 300 ft. per minute. This is accomplished by means of the controller situated inside the attendant's cabin.

The hoisting motor, cross-traverse and longitudinal travelling motors have gravity brakes connected in series with their fields; this form is considered very effective, as should the current fail through any cause, the brakes will be immediately applied. In addition, the hoisting motor has both foot and hand brakes.

The erection of the crane was carried out by Mr. Alfred Short, engineer, Durban, under the supervision of Mr. Thompson, mechanical engineer to the Natal Harbour Board. The electrical equipment was done by the Natal Harbour Electrical Department, under the supervision of Mr. G. Stobie, Government Harbour Board electrical engineer.

The erection of the gantry has been carried out with the greatest expedition. The time taken in erection was only two months. The foundation is a substantial construction of concrete 13 ft. × 6 ft. × 4½ ft. The cost of the whole structure, including crane and motors, amounted to £13,500. The crane itself, which weighs about 95 tons, was lifted in one piece to its position on the gantry rails, a height of 22 ft. This difficult work was done by means of staging and hydraulic jacks.

TECHNICAL CLASSES.

By W. G. RHODES, D.Sc., M.I.E.E.

Prompted by the leader in a recent issue of the Electrical Review, I venture to make a few remarks on this important topic—important because *good* technical classes are needed, and important because a great amount of public money is being spent—some say wasted—on technical education.

I do not propose to deal now with regular day courses, as I have already, on other occasions, expressed my views thereon. It is the evening classes about which I desire to say something.

As is indicated in the leader referred to, evening students attend classes in order to obtain some information directly bearing upon their daily work, in order to become more intelligent and more efficient workmen.

The question arises: Are evening classes usually arranged and conducted in such a way as to meet this requirement? There is a doubt about it.

To illustrate our argument, take the case of a dynamo designer—there are many who do not understand the underlying principles thoroughly—wishing to obtain a clearer insight of the subject. He works, say, in one of our large towns where there exists a technical school which is ostensibly conducted on the most approved lines.

What can he get?

There may be a special course of lectures on dynamo design, but as a rule the lecturer will assume as *known* the very things which many of the students *wish to learn*, as, for instance, the formulæ—

$$E = \frac{n\,C\,F}{10^8},$$

$$F = \frac{4\pi N i}{10} \div \Sigma \frac{l}{\mu A},$$

or methods of measuring resistance, permeability, &c.

If he does not fully understand these, he is informed that he should attend the regular and stereotyped courses which prepare for the examinations of the City and Guilds. If he, acting on this advice, joins such classes—especially the ordinary grade—he has to attend some 30 lectures in order to obtain information which could be given in ten. The remainder, though undoubtedly useful, do not contain matter immediately bearing on the subject.

It is not in the amount of money spent on technical education that the error lies, but in the faulty organisation of the technical classes.

Another subject worthy of consideration is the lecturer himself. I am speaking feelingly here, with the knowledge got from experience.

A lecturer should not be compelled to give many lectures per week—certainly not more than one each evening for four evenings per week. Laboratory work in addition does no harm.

A lecture, especially an advanced one, is a great strain on a lecturer who not only delivers good and well thought out lectures, but who, by watching the expressions of his students, can detect want of comprehension, and then, by variation of language, by intonation, and by gesture, drive the point home and send all but the very dull ones away feeling that they have learnt something, and creating in them a keen desire to know more.

Such a lecturer is worthy of all consideration, and if not overworked will maintain his efficiency and keep good classes together throughout an entire session.

How often do we find classes dwindle down to about one quarter of their original number before the end of the session?

I have indicated one very common reason for this. Others no doubt exist, but a clear and enthusiastic lecturer has great power over his students. It is, in fact, the personality of the lecturer which determines the success, or otherwise, of a class.

THE NAVAL ELECTRICIAN.

The idea of becoming a naval electrician probably appeals to a good many lads who have some knowledge of electricity, and fancy the prospect of going out into the world on board a man-of-war; to not a few of these the uniform is, perhaps, an attraction, with its peaked cap and brass buttons savouring of the full-blown naval officer.

Far be it from us in any way to discourage a feeling of pride in the uniform of either of the services, for it is surely a pardonable form of vanity that brings out such qualities as are needful "for the sake of the cloth."

However, it is but fair to point out to those who may only have seen the shore-going side of life, that there is a good deal beyond the peaked cap and the high-sounding title of electrician, which does not appear on the surface.

To begin with, the title electrician is, perhaps, a little misleading, for it would seem to imply that the holder of it is responsible for, and generally in charge of, the electrical plant on board ship. One might be led to infer that his opinion on electrical matters would have considerable weight, and that he was, in fact, more or less of a "boss" in his own particular line.

Now, as a matter of fact, the electrician is not an officer at all in the naval acceptance of the word; he is a mechanic pure and simple, supposed to have special knowledge of the sort of work required in the adjustment and repair of electrical instruments.

The electrical engineer of the ship is the torpedo officer, whether he be a warrant officer or a lieutenant appointed for these duties; his right hand man is the torpedo instructor, a man who has entered in the ordinary line and has taken up the torpedo branch in preference to gunnery.

The electrician occupies rather the post of instrument maker, though his actual duties in a great measure depend on his special aptitude for certain kinds of work as observed by the torpedo officer.

As an example, let us take a battleship or large cruiser, and see in what manner the work is generally divided up and what duties in particular will be likely to come under the care of the electrician. To do this we must endeavour to place ourselves in the position of the torpedo officer, and see what arrangements are best suited for the disposal of the staff under him.

As regards the work that it is his special duty to supervise, it may be divided first of all into two great

items: the illumination of the ship and the efficiency of the Whitehead torpedo armament.

His staff will probably consist of two electricians, two torpedo instructors, a few permanent ratings in the torpedo branch—some half dozen or so, and any men that the commander may be able to spare for special work that is in hand and requires what one might call unskilled labour, such as the cleaning of torpedo tubes and such minor odd jobs.

The half dozen or so permanent "hands" would be called the electric light party, and the bulk of them would be employed going round chasing earth leaks, repairing circuits and renewing lamps wherever necessary.

A responsible man must be in the neighbourhood of the switchboard, another reliable man should be in charge of the electric light party, a third is required to look after the bells, batteries and telephones.

Now all these men have their own little calls upon the electrician's workshop; they go round and gather up the fragments of misapplied ingenuity which follow in the wake of untutored ambition.

There are switches which have suffered from some burly autocrat who did not realise that the current was broken at the sectional box, galvanometers which have had their faces slapped and turned sulky, other instruments which have displayed a marked antipathy to sea-water, and a host of minor fittings with which sea air does not agree. All these things claim the attention of the electrician, and test his skill as an artificer in brass, but they do not, as a rule, require any great technical knowledge. The electrician whose duty it may be to attend to these items has his hands full, and it is always easier to write up the defect book than to write the items off.

But, besides electric work, the torpedoes claim a large amount to the torpedo officer's attention; men must be detailed to look after these, and a specially skilled and neat workman must attend to the gyroscopes, upon which the straight-running of each torpedo depends.

A gyroscope consists essentially of a perfectly-balanced heavy fly-wheel, running on ball bearings.

Now, everyone who has possessed a bicycle knows that it requires a definite amount of force to turn the front wheel when it is set spinning rapidly in the air; it is precisely this force that is made use of in the gyroscope when the little fly-wheel is set revolving, and the resistance to any turning movement is made to act upon valves which control the rudders.

This little instrument, which forms an integral part of each torpedo, is exceedingly sensitive, and at the same time it is of the utmost importance that it should be accurate.

Who better than the electrician, with his skill in handling delicate instruments, for the job? So it comes about that electrician No. 2 becomes a specialist in the art of gyroscope adjusting to the exclusion of almost any kind of electrical work whatever.

Now, to the man who has taken up electricity as a study, who has studied the theory of it, and, perhaps, prides, himself on his electrical certificates, this may, possibly, be decidedly disappointing; he had, perhaps, visions of wireless telegraphy, and the large field of investigation that this branch of the subject throws open to the inquiring mind; he had pictured himself in charge of a ship's installation with all its ramifications, the ball systems, telephones, telegraphy, lighting, battery work, dynamo and motor work and all varieties of testing; his certificates are a guarantee of his right to an opinion, and his title would seem to invite it, but he finds himself instead tied down to his lathe, making endless terminals and ebonite bases, carrying out routine orders, and consulted in nothing; there is another in the place that he thought to occupy, and he is not even this person's deputy, for there are torpedo instructors whose official certificates entitle them to a higher place.

It may not always be so—in fact, it is probable that there will be great changes in the near future—but for the present we would point out the advantages of working up through the regular line where it is a case of ambition, for the torpedo instructor becomes eventually a torpedo officer, and, in due course, may even get a commission.

The naval electrician is, however, not at all badly placed when once he realises his true position; as an instrument-maker no one can touch him; he is master of his craft, and as such will earn the confidence of his officer. Once this is established it is not likely to be forgotten, and he will be looked upon as a man of no small importance.

Electricity is more or less of an innovation in the Navy, and it is daily growing in importance. The electricians, as a body, must remember that the engineers started in much the same way, only with more prejudice against them; within the last few years recognition of their merits has come to them in rapid strides, and there would seem some likelihood of considerable changes being effected in the electrical branch.

Torpedoes and the electrical plant have little in common; the link was first welded in the adoption of electrically-fired mines, when the torpedo officer was the only individual who was supposed to be sufficiently well acquainted with the fact that electricity can only travel along a metallic circuit, and is held there by the surrounding insulation through which it cannot pass.

In these days of high frequency currents, specific inductive capacity, self-induction, and so forth, he has to know a good deal more, and modify the views of his predecessor considerably; leaving out his executive work, leaving out even his Whitehead torpedoes, he has still quite enough to worry him as an electrical engineer, and the day is probably not far off when, putting aside his other duties, he will assume the latter sobriquet alone.

This will be the day for the electrician; and after all, for those who like the work, the pay, which starts at 5s. a day, is remarkably good for the Navy; the standing is that of a chief petty officer or an artificer, and one may assume, with a fair amount of confidence, that there will be prospects of advancement.

CORRESPONDENCE.

Letters received after first post on Wednesday morning cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Electricity Charges.

I am submitting for the perusal of your readers a system of charging for electricity which may be of interest to large power companies who supply energy to councils, factories, works, &c. The system I would suggest is one which deals with the three following factors:—

1. The cost of coal.
2. The magnitude of the consumption.
3. The load factor.

Now these factors should be easily and readily combined in a table, so that, in getting out an account, the price per unit chargeable could be seen almost at a glance.

The writer tenders the following combination of factors and tables to eliminate as far as possible the time generally taken to work out the cost of a unit under varying conditions:—

Table A.—Cost of Quarter at Rate per Annum.

Load factor.	Units. 50,000.	Units. 100,000.	Units. 250,000.	Units. 500,000.
10%	2·5	2·25	2·0	1·5
12%	2·25	2·0	1·75	1·25
15%	2·0	1·75	1·5	1·0
20%	1·75	1·5	1·25	0·95
25%	1·5	1·25	1·0	0·93
30%	1·25	1·0	0·95	0·9
40%	1·0	0·95	0·93	0·85

Table B.—Coal Price Multiplying Factor.

7s.	8s.	9s.	10s.	12s	13s.	14s.	15s.	16s.	17s.
0·8	0·85	0·87	0·9	1·0	1·1	1·2	1·3	1·4	1·5

Example I.—A borough council is a consumer, and uses 130,000 units per quarter, which is at the rate of 520,000 units per annum. The price of coal for the year is 10s. per ton, and the load factor is 30 per cent., being a tram system. From Table A. opposite 30 per cent. and 500,000 units read

·9d. From Table B. under 10s. read ·9. Now ·9 × ·9 = ·81d. price per unit to be charged.

Again, a smaller consumer, consuming 10,000 units per annum, with a wholly lighting load, and coal at the high price, 17s. per ton, and a low load factor of say, 10 per cent.

From Table A. we get 2·5, and from Table B. 1·5.

Then 2·5 × 1·5 = 3·75d. price per unit to be charged.

These are two extreme cases.

The small consumer using 40,000 units per annum, with a poor load factor and the cost of coal high, is charged 3¾d. for his unit of electricity, whilst the larger consumer, who uses just over half a million units per annum when the price of coal is 10s., and a high load factor of 30 per cent., is charged only ·81d. per unit.

The load factor and the price of coal must be brought into the cost, as well as the sliding scale adopted in the above tables.

I merely give the idea for what it represents, and I place no value upon any of the figures given. It is merely the method of uniting the three dominant factors necessary for an equitable system of charging which I wish to submit.

Treyer.

The All-Steel Railway Car.

All-steel railway carriages are no novelty, as they were tried over 50 years ago in England with disastrous results. The carriage constructors at that time had as extravagant hopes as the Brush Co. now have, but railway passengers avoided the cars as they would a pestilence. The extreme sensibility of steel to heat and cold makes it an undesirable material for anything in railway carriage construction save the framework, and the discomfort and awful feeling of shivering and cold which a winter journey in the all-steel carriages produced was quite sufficient to soon cause passengers to hate the cars. Comfort in every sense is the main thing that attracts passengers, and no material for car finishing affords this in so high a degree as wood does, because wood neither attracts nor retains heat or cold as steel does, and non-inflammable wood is even less conductive than ordinary wood.

I am afraid that the Brush Co. and the new tube companies are making a costly error in adopting for car interiors a material which will chill passengers to the marrow in winter and give them an unwonted Turkish bath in summer, and that the doctors and undertakers will reap far bigger profits than the owners of the cars are ever likely to see.

Experience.

[So far as the winter cold is concerned, we have endured great sufferings in wooden coaches, which were never properly warmed until recent years. Now, however, rapid progress is being made in the warming of trains by exhaust steam or electricity, as the case may be, and as the passengers will not be expected to sit on the naked steel, we are of opinion that this trouble will not be of a serious nature. On the other hand, we have in the past experienced those Turkish baths mentioned by our correspondent on the Metropolitan and Metropolitan District Railways; under the new conditions obtaining on those lines it will be possible to secure ventilation without suffocation, and thus, we hope, the zone system will not be a torrid one. As for main line trains, they are not likely to become too hot, thanks partly to the peculiarities of our climate, partly to the rapid motion through the air.—Eds. E.R.]

Olympia Exhibition: Free Tickets?

We should like to add a word in support of your correspondent, Mr. C. Rockley, in to-day's issue, with regard to the free admission of the public to the above Exhibition; taking the view of a few exhibitors expressed within the last few hours, the general impression seems to be that we are far behind the gas companies in the manner of working their Earl's Court show; and as your correspondent remarks, their representatives scattered tickets broadcast, to the writer's personal knowledge. We think that if this were brought to the notice of the municipal and private supply companies by a circular, say, from the Executive Committee, it might induce a larger number of the general public to visit Olympia during the Exhibition, who at present take no interest in the application of electricity to their own use. We trust that these letters may induce the supply companies, &c., to move in the matter, and so make the Exhibition a big success, which would re-act throughout the trade generally.

Foxcroft & Duncan,
W. J. V. Duncan.

London, *September 29th*, 1905.

Oerlikon Generators in Dublin.

I thank you for having published my letter of 25th inst. *re* Pigeon House Fort electricity works, and would point out two clerical errors.

In the last paragraph but one of my letter, it should read:—"By-the-bye, the two 1,000-kw. and the two 500-kw. high-tension *three*-phase generators erected at Dublin were designed as far back as *1899* to 1900 at the factories of the Oerlikon Co. in Switzerland.

G. Wüthrich.

London, S.W., *October 2nd*, 1905.

Starting Steam Turbines.

Having taken a good deal of interest in the gradual development of the steam turbine, I would like to make a few remarks on "Greaser's" letter in your issue of September 29th last, regarding Willans & Robinson's patent turbine blading, in which the individual blades are protected within a shrouding.

It is claimed in favour of this method of blading that, in the event of contact of the revolving part with the stationary case, merely a portion of the shrouding, namely, at the point of contact, will be ground down (instead of the blades being stripped); but "Greaser" apparently objects to this grinding down of the shrouding on the ground that the working clearance will be increased, and hence also the steam consumption.

"Greaser" should, however, bear in mind that in the event of accidental contact occurring, it is only a small portion of a few rings of blades—probably only a small portion of a single ring of blades (out of some 60 or 90 such rings of blades in the turbine) which will touch, and that the portion of the clearance affected is but an infinitesimal part of the whole.

Any slight increase in steam consumption cannot be compared with the pecuniary loss resulting from a complete stripping of the blades, which is the alternative with unshrouded blades to the slight grinding down of shrouded blades.

Regarding "Greaser's" remarks on the general progress of turbine manufacture in this country, I think he will find if he has a talk to engineers who have studied the progress made by various firms in this country and abroad, that at all events up to the present, neither America nor the Continent, can produce anything to excel in workmanship and general efficiency the best that this country can produce.

And, further, I think that "Greaser" will also find, in a year or two's time, that the various firms in this country who are devoting themselves to improving the Parsons type of turbine, will be able to congratulate themselves that they have allowed Continental and American firms to occupy themselves with the introduction of new types of turbines, in place of perfecting a type that has stood the test of time, and has been responsible for the almost general adoption of rotary engines.

Britisher.

[A correspondent calls attention to a letter by Mr. W. L. R. Emmett to the *Street Railway Journal* (U.S.A.) of Sept. 9th last on this subject. Mr. Emmett referred to the suggestion that large steam turbines required warming up before starting, and said: "While many turbines now in operation require such treatment, it is not required in turbines recently produced by the General Electric Co. if they are properly set up and adjusted.

"With these turbines, the matter of clearance between revolving and stationary parts, within such limits as are

ever desirable, does not affect the steam economy to an appreciable extent. Clearances from $\frac{1}{8}$ in. to $\frac{3}{16}$ in. are used on large turbines, and if under any extraordinary conditions these should prove insufficient, a considerable increase can easily be provided without appreciable effect upon the steam economy. It is also possible to increase the clearances of existing machines where trouble is experienced, and in a few cases such changes have been made." He also quoted from a paper by Mr. A. S. Mann, which we published in our issue of June 23rd last, and in which Mr. Mann stated that a steam turbine could be run at full speed in $2\frac{1}{2}$ minutes from the time of starting cold.—Eds. E.R.]

An Overcrowded Profession.

At the request of the Editorial Board of the University Engineering Journal of Birmingham, I am writing to take exception to the words of your correspondent, Mr. R. Browne, of Sidcup. He says among other things, "that we have not a College or Institution within the shores of these Islands where a complete training can be had in any one branch of engineering."

My Editorial Board wish me to point out that Prof. Gisbert Kapp is the head of the electrical engineering department of this University; that a sum of nearly half a million sterling has been spent during the last three years in building and equipping huge engineering laboratories, which, according to Mr. Joseph Chamberlain, are second to none in the world, and which, those who have visited the Continent tell us, are at least equal to the great German College of Charlottenberg.

We all of us agree that there should be many such colleges in England. It may be that in a few years there will be colleges built which will overshadow the present efforts of Birmingham; and in that case the example set by the Midland city should be remembered. More money is still wanted for engineering education at the universities; but it is somewhat curious that a correspondent of your widely read paper has not noticed the articles on the facilities at Birmingham which have already appeared in it. If he cares to pay the postage, we will let him, or any other *bonâ fide* ignorant reader, have our amateur journal for a period of 12 months, so that they will know something of what is being done for engineering education at this University. It is only fair to add that this journal is managed by the engineering students.

Editor of the
University Engineering Journal.

The University, Birmingham.
October 2nd, 1905.

[Apparently the expression "a complete training in any one branch of engineering" should be more strictly defined. Granted that a magnificent institution has been organised and equipped in Birmingham; the fact remains that all the colleges in the world cannot make an engineer. One of the most important, and certainly the most essential, qualifications of an engineer is *experience*. He cannot get that in a college.—Eds. E.R.]

Money for Nothing.

It has gradually, but none the less forcibly, been impressed upon my mind that when a young man enters the electrical profession he has to combine work and study for a matter of about 10 to 15 years before he is considered anything but an improver, or at any rate it is apparently so from the wages offered. If one were to let his mind wander over the various experiences necessary to obtain 28s. per week as pointed out by "Sub-Station" last week, he would find it necessary to have been in the following situations, namely, shift engineer, mains assistant, switchboard attendant and test room assistant, leaving out of count altogether theoretical training and list of certificates, to gain which means night after night of hard study. I notice also a vacancy for an engine driver cleaner, who must have had experience in direct current switchboards, to work 12-hour shifts, which I take it means 84 hours per week, for which he will receive 25s. per week, which works out at about 3·57d. per hour. It was not many months ago that I referred to wiremen as overworked underpaid heroes, but what are these?

With this question I will leave each one to his own thoughts, at the same time feeling thankful that I do not hold a position either as a junior engineer or as an engine driver cleaner with switchboard experience.

W. Y. Newland.

The Electro-Deposition of Copper.

My attention has been drawn to the report of a meeting of the Faraday Society at which Mr. Cowper-Coles read a paper on "The Electro-Deposition of Copper." It is not my intention or desire to take part in the controversy which has been raised, but I must emphatically protest against the statement made by Mr. Cowper-Coles that "the burnisher causes lamination." At our works at Schladern-on-the-Sieg, Germany, during the past 14 years we have produced by the Elmore process a very large quantity of seamless tubes, from the smallest diameter up to 8 ft., and the returns on account of lamination are practically nil. That this must be so is proved by the fact that we have all the best known consumers on our books, in addition to having been the sole contractors to the German Navy for a great many years.

By the Elmore process any tube can be replaced in the bath and deposition can be recommenced without the slightest sign of lamination, even though the copper is heated and hammered down to a knife edge.

Harry Ellis,
Managing Director.
Elmore's Metall Actiengesellschaft.

London, E.C., *October 2nd*, 1905.

Novel Methods in Australia.

In reply to Mr. Weston's letter under the above title—which title I hope will not be credited to me—I beg to point out that in the diagram of switchboard connections of the Empire Electric Light Co.'s station, the position of the circuit-breakers was fixed, not in ignorance, but for the very good reason that, when putting in a new machine, it is not desirable that the last switch to be closed, namely, the armature switch, should be the only automatic one on the machine. By putting it on the field side, however, if anything should be wrong, it will throw out on closing the armature switch.

In the case of a circuit-breaker opening, the switchboard attendant at once opens the armature switch, but beyond causing a bit of sparking at the brushes, the machine, if motored, would not hurt itself.

To avoid this, in a later panel the circuit-breaker is not operated as a switch, but is left closed, and is placed on the negative or armature end.

J. R. W. Gardam.

Sydney, N.S.W., *August 29th*, 1905.

The Wiring Industry.

Whilst reading the recent correspondence, I thought of several splendid examples of country house installations which it has been my good fortune to inspect, and wondered, as these works have been carried out by an eminent firm of house furnishers, who are also tinkers and if not tailors, certainly candle-stick makers, whether they employed a staff of electricians, or was the work done by the man that lays the carpet on the stairs?

M. McBratney.

Newport, *August 2nd*, 1905.

Design of Instruments and Meters.

In reading "O.K.'s" homily under the above title in your issue of September 30th, we hardly know whether most to admire his modesty in concealing his identity under so appropriate a *nom de guerre*, or his sublime indifference to facts.

Of wattmeters with "ball bearings" or "magnetic suspension" we need say nothing, as we do not make these, and have never, so far, heard of anyone who did. We were at first tempted to think that watt-hour-meters were meant,

but it seemed presumptuous to impute so gross an error to so painstaking a critic.

We are, however, the firm who "brought forth the monster"—"the freak . . . . which looks like the work of some overwrought brain" (we quote from "O.K.'s" letter, and not from a penny novelette)—and very proud we are of having done so.

After your excellent description of the instrument contained in your issue of September 22nd, it seems hardly necessary to recapitulate the advantages possessed by these recorders; but in view of "O.K.'s" statement that "the only advantage that can be claimed for this improvement is that no fluid (*sic*) ink is used, and therefore the instrument will not get splashed in ink," it may be well to do so.

What we claim is that the "record" is uniformly clear, and is not dependent on the care exercised in keeping the pen in order; that the instrument is accurate, since the index takes up its correct position on the chart unimpeded by frictional contact between pen and paper; that, on this account, the "power" required to work satisfactorily a recording instrument is no greater than that necessary for an ordinary indicating instrument, and consequently such a recorder may be worked off the same shunt or transformer, which in the case of heavy currents often effects a considerable saving in both initial and running expense; that for the same reason the problem of satisfactory recording alternating current instruments, such as ammeters, wattmeters, power-factor indicators, &c., as also temperature recorders and other such instruments, suffering from lack of sufficient power to overcome friction is, solved; that there are no clocks to be wound, or pens to be filled; that any number of recorders and switchboard or station clock dials can be driven by the same master clock with the absolute certainty that the timing of the whole set will be identical; that only one clock has to be timed, and that the clock system after having been in successful operation in a very large number of installations for many years has proved itself absolutely reliable; in fact, simplicity is the key-note of the whole arrangement.

The construction of "O. K.'s" fifth paragraph is so involved and the metaphors are so numerous and so poetic that we are not sure that we quite grasp its meaning, but we might perhaps be allowed to remark that in an installation of those recorders, whether consisting of one or, say, six, there is no relay and only one contact, but "O.K.'s" touching allusion to the "feeble-minded youth" (why "feeble-minded" we cannot say) who is expected to "fake up the relay contacts; those contacts! !" is much more dramatic, so let it pass. The fact that he has apparently neither seen the instrument, nor understands its working is, of course, quite a minor consideration.

Should "O. K." care, however, to do both, we shall be most happy to see him at our stand at the Olympia Exhibition, where we have these recorders in operation. (Modesty forbids that we should repeat the compliments there showered upon them.)

Finally, we cannot help regretting that in having your description of September 22nd reprinted we were too soon to be able to include "O.K.'s" letter. It would have been a most welcome addition, since the humorous touch is always so acceptable in these matter-of-fact days.

Everett, Edgcumbe & Co., Ltd.,
Kenelm Edgcumbe, *Director.*

87, Victoria Street, S.W.
October 3rd, 1905.

Some "Arithmetical" Questions for Mr. Pollard Digby.

I note Mr. Pollard Digby has made some attempt to answer the question I put in a previous letter, viz., How is it possible to give preference to imports of a life-supporting nature, without placing an import duty on imports of a non-life-supporting nature?

Mr. Digby would seem to suggest that my ideas on the matter in question are somewhat crude, but at the same time entirely evades the question, by introducing the usual red herrings. I can in no way appreciate Mr. Digby's suggestion that more than two dimensions are necessary, and cannot admit for a moment that our internal trade has anything whatever to do with the point at issue.

Roughly speaking, we cannot under any circumstances produce within the British Isles sufficient life-supporting commodities to enable us to more than support about one-third of our present population, hence it is absolutely necessary to import the remaining two-thirds required from somewhere else, and whether our internal trade is entirely stagnant, or booming, there still remains this two-thirds of life-supporting commodities to be imported.

Such being the case, it should be entirely obvious that to enable us to support any increase of population whatsoever, our imports of a life-supporting nature must increase *pro rata*. The only point that could possibly be open to doubt, is whether by placing an import duty on goods of a non-life-supporting nature, it would be possible thereby to increase our imports of a life-supporting nature, which, as has been shown, we must increase to enable us to provide for our natural increase of population.

Taking this as the basis that entirely controls our national growth, the point is, can we find support for even our present population, much less an increase of population, if we are content to go on exchanging our knives for other people's scissors? As matters now work, it is possible for one British industry to entirely kill another British industry, although of quite a dissimilar nature. As, for instance, by reason say that our cotton manufacturers being able to manufacture cotton goods cheaper than Germany, our cotton goods are exported to Germany, and in exchange Germany sends us some other kind of manufactured goods which they can produce, or do produce, cheaper than we do—say, for the sake of argument, woollen goods, the effect being that our woollen goods manufacturers are being very severely hit by what they consider unfair foreign competition, whereas in reality it is our own cotton goods manufacturers that are indirectly responsible for the downfall of the woollen goods manufacturers.

This is the necessary result of exchanging knives for scissors. If we put an import duty on woollen goods it would have the same effect, of course, as increasing the cost of production, and Germany would have to send us something else—say, sugar in larger quantities in exchange for our cotton goods. Very little, of course, can be done in this direction in our dealings with Germany, as Germany principally exports goods of precisely the same nature as we require to export ourselves, and requires precisely the same class of imports as we do—that is, goods of the nature they cannot possibly produce in sufficient quantities to meet their requirements.

But take another case; where both Germany and ourselves are trading, say, with some neutral market exporting manufactured goods of a similar nature to our own and Germany's exports, and also goods of a life-supporting nature, which both Germany and we require.

Germany, by her import taxes, prevents her exchange being taken out in manufactured goods similar to her own exports, and takes from this neutral market what she most requires, whilst we, on the other hand, accept in return for our exports to this neutral market, their manufactured stuff, which may be simply a lower-priced article of precisely the same class of goods that we exported. In fact, we might have been just as well off if we had done no trade with this neutral market at all, or even perhaps better off, as possibly the goods we made at home, although of nominally higher price, might have been better value. I cannot understand how it is that the enormous importance of this question seems to be so little appreciated, when our very existence as a nation is so entirely dependent on the nature of our imports—that is, two-thirds of our population and all further increase.

H. W. Wilson.

Stowmarket.

The Truth About Gas.

According to the *Journal of Gas Lighting*, in its article on "Gas *v.* Electricity," it would seem that electric light is of no use as an illuminant. To go into this matter would be needless waste of time, as the comparisons are simply absurd. There are, however, two statements I should like to point out:—

1. Liverpool is in favour of, and lighted by, incandescent gas.

2. Bradford is entirely lighted by incandescent gas.

With regard to Liverpool, it does not say, by the way, that all the *finest* and most *important* thoroughfares are lighted entirely by electric arc lamps, and that incandescent gas is used for the side streets and suburbs, where it is thought sufficient. With regard to Bradford, the statement is quite correct; but any reasonable man will agree that it is one of the worst lighted cities in England. I speak from personal experience. In a certain part here there is an arc lamp on a trolley pole, and about 30 yards away a powerful incandescent gas lamp with six burners; although twice as high and some distance away, the arc lamp casts shadows of people passing under the gas lamp and even beyond it. And some people compare gas to electricity!

I should esteem it a favour if you would insert this letter in the next issue of your valuable paper.

An Old Reader.

[As for Liverpool, half-truths are proverbially mischievous, and the same half-lie has been put forward in numerous instances. We do not deny that gas lighting is good enough for back streets and lanes; but we emphatically maintain that important thoroughfares can be lighted both better and more cheaply with electricity than with gas.

As for Bradford, its miserable gas lighting is notorious, and has been mentioned in the Electrical Review on previous occasions.—Eds. E.R.]

INTERNAL COMBUSTION ENGINES.*

By DUGALD CLERK, M.Inst.C.E.

(*Concluded from page* 494.)

In order to make use of higher compression without any risk of pre-ignition, the author has designed two types of engine, one to use air super-compression, and the other to use cooled exhaust super-compression, while Messrs. Crossley use water injection for the same purpose.

Of all the troubles of pre-ignition, back-ignition, and exhaust explosions, the former is the most serious, the others being under control in a well designed engine kept in good order. Attempts to avoid pre-ignition by compression of the air only, adding the gas at the moment of completed compression, have proved successful, but the mean pressure obtained is too low.

Herr Diesel's methods as applied to gas have so far failed; but he has made a fair success with his oil engine.

Dealing with examples of internal combustion engines in Britain, the author described first the Clerk cycle engine, in which the motor cylinder had large ports at the front end leading into an annular space forming the exhaust port, the compression space was conical, and the charge was sent in by a separate pump, the action of the engine being as follows: When the piston was out at the end of its stroke, and the crank was crossing the out centre, the piston over-ran the exhaust ports on the out-stroke and covered them on the in-stroke. Meanwhile the pump piston was sweeping in and giving its charge a slight compression. That charge passed through a check valve into the conical end, displacing before it all the contents of the cylinder.

When the main crank had returned about 40° of its circle under the centre, the exhaust ports were closed. By that time the pump piston had gone fully in and delivered its charge into the cylinder and combustion space through the lift valve. Then the motor piston compressed the charge, and ignition took place at the end of the stroke as in the Otto cycle. The object of the invention was to enable an impulse to be given at every revolution, and to get very much more power for a given weight of engine.

Comparing the Clerk cycle with the Otto cycle, it was shown that the velocity of charge entrance in the former was about three times that in the latter, this constituting the great weakness of the Clerk cycle as constructed at present.

To overcome the other disadvantages of the original Clerk cycle, the author in 1881 adopted the method of sending first into the cylinder a good heavy charge of air to displace the exhaust products, and then following it with a somewhat strong charge of gas and air, as is being done to-day in all the large gas engines; however, the maximum efficiencies that are possible with the Otto cycle have not been obtained with any two-cycle engines.

The modern representative of the Clerk cycle is the Koerting engine, but in these large engines there are separate pumps for the gas and air, and an explosion occurs at each end of the cylinder, thus rendering it double acting, with two impulses every revolution. If it were possible to charge the cylinder with absolute certainty, without any chance of loss at the exhaust, there would be a great deal to be said for this cycle, because it gives a very powerful engine for a comparatively light weight.

The working of the Oechelhaeuser engine is somewhat on the same lines; it is a very interesting engine, and runs with great smoothness. This engine has two opposing pistons driven from a crankshaft in the front part of the engine; a central crank-pin drives the front piston and two side cranks disposed exactly opposite drive by side rods the back piston. This arrangement produces a very nicely balanced engine, all the strain of the explosion being removed from the frame and taken by the cranks only. The two pistons both overrun ports. In the front end the piston overruns the exhaust ports, and the pressure falls to atmospheric, as it does in the Clerk and Koerting engines. A little later the back piston is overrunning the air ports. Air first enters the cylinder, displacing the exhaust gases, and in this way the cylinder is cleared of the hot incandescent matter before the gas enters. Then as the piston moves further back, the next ports are uncovered and gas enters, coming from a separate reservoir. The mixture of gas and air runs right up the cylinder, discharging the exhaust gases and the air that has been put in first; then compression takes place, followed by ignition and expansion. An arrangement of pumps supplies the air and gas under a slight pressure. In this engine there are no valves, so far as combustion and explosion are concerned, except the pistons themselves.

The engine, however, has disadvantages; it is a more expensive engine to build, and requires a very considerable weight of metal for a given power.

Although not quite up to the Otto cycle in economy, this type of engine has given great satisfaction in Germany, and is said to be running very well in England in regard to requiring but little repair.

Another modification of the Clerk cycle is the Day engine, in which the front end of the cylinder and the crank are enclosed, very much like the modern petrol engine; the front end is used to take in the charge and displace the exhaust products. One often sees in motor and other papers that great surprise is expressed that more power is not obtained from an engine of this type; but the general effect of this cycle is that instead of getting, as in the Otto cycle, a mean pressure of 80 lb. per sq. in., not more than 45 to 50 lb. is obtained, and although there is an impulse every revolution, nothing like double the power of the Otto cycle is obtained.

For the Otto or Clerk cycle, where the expansion is carried to the volume occupied by the charge before compression, the ideal efficiency is:—

$$E = 1 - \left(\frac{1}{r}\right)^{.08},$$

and the same formula applies to the constant pressure cycle where expansion is carried to the same pressure as before compression; but in the Diesel, or constant pressure cycle, where expansion is not carried to atmospheric pressure,

$$E = 1 - \frac{T_1 - T_0}{1{\cdot}408\ (T_x - T_c)}.$$

T_0 = temperature of charge before compression.
T_c = temperature on compression.
1·408 = ratio of the specific heats.
T_x = maximum temperature of combustion.
T_1 = temperature at the end of expansion.

Diesel's attempt to follow the Carnot cycle resulted in getting the advantages of the constant pressure cycle without danger of pre-ignition; in his engine it is impossible to have pre-ignition, as there is nothing to ignite too soon.

* Extracted from Cantor Lectures delivered before the Society of Arts on February 13th, 20th and 27th, and March 6th, 1905.

The efficiencies of the Carnot cycle, constant volume and constant pressure engines being equal for the same compression, nothing is gained by adopting the Carnot cycle.

Many attempts have been made to construct constant pressure engines for gas, and the lecturer in describing his results in this direction in 1888 said that the engine was perfectly free from gas engine troubles, but only low average pressures could be obtained, 30 to 40 lb. instead of 70 to 80 or 90 lb. as now usual.

As the gas must be compressed to full pressure before ignition, there is always more or less liability to explosion, and this is the main reason why this cycle has not come in for gas engines.

Reviewing ordinary gas engines, it was stated that up to about 300 H.P. all difficulties had been overcome, but above that there was considerable room for difference of opinion, and engineers were fighting the battle of the big engine at present.

After a brief description of the Cockerill type of engine, and a reference to the improvement in the disposition of the valves above and below, instead of all below, it was pointed out that most designers now went in for double-cylinder double-acting engines, the weight for a given power being materially reduced.

Briefly referring to petrol motors, their power, speed, and serviceableness were extolled, and attention was drawn to their rapidly approximating to standard conditions, the vertical type being most general. In a test of a 6-H.P. Wolseley motor the indicated efficiency was 19 per cent.

The suction producer is already well established, and many hundreds of installations have been set to work during the past year, and are now operating with great success; while the thermal efficiency of pressure producers is about 75 to 80 per cent., that of the suction producer ranges up to 90 per cent. The engine draws the gas through the producer in exactly the quantity required for its operation, no fans or blowers being required. The mixture of steam and air sucked in through the producer gives CO, H, and a little hydrocarbon, with N from the air, which goes through the scrubber. There is no danger of poisonous or inflammable gas; the gas in the producer and in the pipes is always at a pressure a little below atmospheric.

The producer may be placed in comparatively confined spaces without danger of gas poisoning, and, consequently, all over the world these producers are coming into use.

With anthracite at 24s. per ton, the cost is ¼d. per H.P.-hour, or with Scotch anthracite at 15s., $\frac{1}{10}$d. The sizes of producers in operation in Britain vary from about 10 H.P. up to 200 H.P., though the lecturer said Mr. Dowson told him he was in a position to build them of 500 H.P., if required.

The suction producer offers very serious rivalry to coal gas, which would require to be supplied at about 9d. per 1,000 cb. ft. to compete on equal terms.

In regard to bituminous coal producers, Mr. Clerk said he had only seen one, but it was working very well indeed. It is rather larger and has more plant about it than an anthracite producer.

The utilisation of blast furnace gas was touched upon, and the necessity for purification of this gas before being supplied to the engine was demonstrated; it was shown that the difficulties with dust and tar varied with the materials used in the furnaces. There are now several large engines at work in this country and many more on the Continent.

Another important question was the distribution of gas from central stations. An example quoted was the South Staffordshire Mond Gas Co.'s large central station, which, when completed, will have a capacity of 15,000 H.P. and distribute fuel gas over an area of 120 sq. miles; the pressure necessary will be about 10 lb. per sq. in. at the station.

The application of internal combustion motors to boats and larger vessels was considered, from the Napier motor launch to barge and sea-going passenger vessels fitted with suction gas producers and gas engines.

Concluding the lectures by a consideration of probable future improvements in gas engines, the gas turbine was referred to as follows:—"Until someone invents or discovers an efficient gas and air compressor of the turbine type, there is no possible hope for efficiency with the gas turbine."

BUSINESS NOTES.

Heavy Traction Switch.—Our note on "The Selection of a Main Switch," on page 515 of our last issue, has attracted the attention of Messrs. Cecil Hodges & Co., of Millwall, who consider that the note exactly describes their heavy traction switch, which they have been making for some time. This switch is illustrated herewith. In addition to the features described in the said article, the makers claim that their switch embodies the following special advantages:—

An independent bearing is provided, so that no current is passed through the working parts. Adjustable contacts are used, the wear of the brushes being taken up by spare liners, which can be easily

Heavy Traction Switch.

inserted, and the switches are designed so as to have the maximum amount of mechanical strength, combined with the highest electrical efficiency.

The handle blade is formed of a malleable iron casting, highly enamelled and nickelled on the front. These switches have been in actual use for some time for traction work, having a very large amount of hard use, and we are informed that they have proved very satisfactory and reliable.

Westminster Electrical Testing Laboratory.—We have received a pamphlet relating to the scale of fees, &c., in force at this laboratory, and particulars of the various tests which are carried out on lamps, instruments, cables, batteries, &c. Lamps on life test are run on a circuit on which the voltage is controlled by means of a specially designed automatic regulator; a recording voltmeter, which is maintained always on the same circuit, shows that the pressure never rises more than 1 per cent. above the normal, and only varies while the regulator is coming into action; an excess pressure cut-out prevents injury to the lamps in case of a sudden rise of pressure, too quick for the regulator to deal with it.

A Wild-Stearn incandescent lamp is used as a secondary standard of candle-power, the ultimate standard of reference being a 10-C.P. Vernon-Harcourt pentane vapour lamp set up at the National Physical Laboratory. Direct-current instruments are standardised against a potentiometer, and alternating-current instruments against electrostatic voltmeters, ammeters, and Wild-Hansard wattmeters, which, in turn, are checked against the potentiometer. The motto of the laboratory is "Thorough."

Electric Launch for Norway.—In our "New Devices, Fittings and Plant" section last week, the electric launch notice was incorrectly headed "for Sweden"; as the letterpress showed, the launch is running on the Norwegian lakes.

Foster Arc Lamps.—We understand that the extensive premises which are being added to Messrs. Holdrons, Ltd., of Rye Lane, Peckham, S.E., are to be lit with Foster's patent arc lamps of their new design, and that the order is for 80 lamps burning in series on 200 volts.

Electric Lift for Buckingham Palace.—The *Times* says that during the absence of the Court from London certain improvements are being carried out at Buckingham Palace, including the provision of a new electrical lift.

British Motors at Liége.—In our description of some of the exhibits at Liége Exhibition we mentioned that British manufacturers were practically absent. We learn, however, that probably the only English-made motors in this Exhibition were some which were supplied to Messrs. Armstrong, Whitworth & Co., and Alf. Herbert & Co., Ltd., for the purpose of driving their exhibits, by the Lancashire Dynamo and Motor Co., Ltd., of Trafford Park. These motors are of special interest, as they are rather large motors for variable speed work. The following is a complete list of them, with the outputs, &c. It will be

noticed that the 40, 50 and 60-H.P. motors are built for a speed variation of 3 : 1 by shunt regulation only.

The same company also supplied a balancer, so that these machines could be run on either 220 or 440 volts, together with a switchboard for controlling the balancer, and motor panels for each motor. These panels are in a cast-iron case, and have a change-over switch for running either on 220 or 440 volts; also an ammeter, worm-geared starter, and a field regulator.

LIST OF MOTORS AT THE LIEGE EXHIBITION.

No. 15	220/440 volts.	20/40 H.P.	200/600 revs.
No. 16	do. do.	60 H.P.	250/750 ,,
No. 15	do. do.	50 H.P.	250/750 ,,
Two No. 11	do. do.	16/32 H.P.	250/1,000 revs.
No. 2	220 volts.	1⅜ H.P.	1,340 revs.
Two No. 7	220/440 volts.	8/16 H.P.	500/1,600 revs.
No. 9¼	do. do.	8/16 H.P.	300/1,065 ,,

Balancer, two No. 10's, 160 amperes, 220 volts, 700 revs.

The Alleged Electrical Fraud Case.—At the Guildhall on 29th ult., further evidence was given in the prosecution of Leslie, Cheeseman, Webber and Rosenberg, who it will be remembered are charged with conspiring to defraud a number of firms in the electrical trade. The two first named were retained in custody, Rosenberg was released on the same bail as before, and Webber's bail was increased to two sureties in £1,000 each.

Brockie-Pell Arc Lamp Co. v. Pinkerton.—In the Shoreditch County Court on Friday, before his Honour Judge Smyly, K.C., plaintiffs sued defendant, of Lloyd's Avenue, E.C., a lamp dealer, to recover the sum of £8 8s. for electric arc lamps supplied. Mr. Lawsen, on behalf of the plaintiffs, said that the defendant rang up on the telephone and instructed the plaintiffs to put in the arc lamps at Messrs. Lilley & Skinner's premises in High Holborn. There was no written order given, nor was the order given by the present manager, but by his predecessor. The work was carried out with the greatest expedition, but when it came to a question of payment, the defendant repudiated the amount of the bill. The charge made was £7 5s. for the electric arc lamps, which, it could be proved, was quite reasonable. Plaintiffs' representative was called, and proved receiving the order over the telephone and having the work executed. There was a great deal to do in the fixing of the lamps. His Honour asked if the plaintiffs confirmed the order which they had received on the telephone on the same day in writing, and was informed that they did not. There was no price fixed for the work, it being understood that it was to be carried out as cheaply as possible. His Honour then asked if the defendant confirmed his telephone order, and was informed that he did not, whereupon his Honour said that it was a most extraordinary way of doing business that two firms should have business dealings and that an order should be given over the telephone and yet neither one nor the other seemed to think it necessary to confirm the order, and if there was a dispute about the work it was hardly to be wondered at. Plaintiffs' representative said that they never considered it necessary to confirm the matter, as they never anticipated that there would be any trouble. The defendant's manager said that so far as he knew there was no order given for any electric arc lamps; if it was it was done by his predecessor. The work that was done, he believed, consisted of washing a few lamps and repairing a few things, a reasonable charge for which would have been about £2 5s. Plaintiffs said they could prove the work they had done.

His Honour: It is no use coming before me with half a story. I will adjourn this case to enable the plaintiffs to prove their case by putting in the time-sheets and other details of the work.

Dissolutions and Liquidations.—HERCULITE AND ELECTRICAL MANUFACTURING CO., LTD.—Meeting to be held at 48, Gresham Street, E.C., on Friday, November 3rd, to hear an account of the winding-up from the liquidator (Mr. W. H. Shephard).

LANCHESTER ENGINE CO.—Meeting to be held at 39, Waterloo Street, Birmingham, November 2nd, to hear an account of the winding-up from the liquidator (Mr. A. H. Gibson).

GRANT'S DRILL AND TROLLEY CO., LTD.—Meeting to be held at Arcade Chambers, Wigan, on October 31st, to hear an account of the winding-up from the liquidator (Mr. G. H. Turner).

WALLACE AND WATSON.—Messrs. E. C. Wallace and E. H. Watson (electrical engineers, 36, Trinity Street, Leeds) have dissolved partnership.

Catalogues and Lists.—MESSRS. DRAKE & GORHAM, LTD., Westminster.—A new price list is being issued of Jandus arc lamps. We understand that the lamp has been redesigned and a number of new types have been added, while reductions in price have been made. Brief specifications and neat illustrations appear of the single enclosure, twin carbon, universal (double enclosure), inverted, pioneer, photo and midget types of lamps. Attention may be drawn to the long burning hours of each pair of carbons, viz., 200. A table of prices of spare parts is given.

UNION ELECTRIC CO., LTD., Queen Victoria Street, E.C.—Advance copy of list No. 8,003 giving prices and illustrations of line detectors, magneto-insulation meters, insulation meters with enclosed dry battery and with enclosed magneto-generators respectively, and direct reading ohmmeters. The apparatus has been specially designed for installation work.

MESSRS. KRAMOS, LTD., Locksbrook Engineering Works, Bath.—Various small catalogues, as follows:—No. 5, illustrating a number of their portable electric drills (the Midget, the Slick, the Hunthru and the Dandy), also flexible shafts; No. 6, dealing with motor-driven lifting block, mixer motor, and other motor-driven specialities; No. 7, describing the Kramos patent controller for electric passenger lifts; and No. 9, giving particulars of their motors, parts of which are shown. A list of patent resistances is in preparation.

MESSRS. JAEGER BROS., 47, Victoria Street, S.W.—Supplementary catalogue of electrical accessories, just issued. High voltage switches, wall plugs, cut-outs, double-pole main switches, ceiling roses and damp and dust-proof fittings are illustrated and prices stated.

THE A.E.G. ENGLISH MANUFACTURING CO., LTD., 4 and 5, New Compton Street, Charing Cross Road, W.C.—October price list of Nernst lamps, containing some fine artistic examples of fittings expressly designed for such lighting. The Luna Nernst and the "A," "B," "C" and "D" types are all well shown, also the Multiple, Express and outdoor types, covers and watertight cases, reflectors and accessories are included. Our readers should take note that the company has taken over the business of the Nernst Electric Light, Ltd., and is now doing the export as well as the home trade.

ELECTRIC AND ORDNANCE ACCESSORIES CO., LTD., Birmingham.—Recently issued catalogue (A63) of electric light fittings, including a variety of polished brass brackets, spider and ball fittings, pendants and table standards. Other leaflets detail the new improved "Stewart" arc lamp, and the "Stellite" medical coil.

PHŒNIX DYNAMO MANUFACTURING CO., LTD., Bradford.—A set of illustrated sheets (bound together in an attractive case with facility for adding later issues) giving a number of excellent half tone prints of the Phœnix dynamo with commutating poles; protected motors, enclosed ventilated D.C. motors, also gas and water tight, geared and open motors; motor-generators, fixed and portable milking boosters, negative boosters, three-phase generators, rotary converters, transformers, and a 300-KW. steam-driven generator set supplied to a Yorkshire colliery.

MESSRS. D. STEWART & CO. (1902), LTD., London Road Iron Works, Glasgow.—Catalogue of hydraulic machinery and appliances describing and illustrating typical work from photographs, the examples including various pumping engine sets, three-throw electrically-driven hydraulic pumps, warehouse, foundry and other cranes, baling and forging presses, &c.

THE AUTO-CONTROLLER AND SWITCH CO., Simplex Works, Vienna Road, Bermondsey.—Leaflet giving particulars of their "Fluxite" soldering paste, which is used by electrical engineers for jointing wires and various other purposes.

MESSRS. FALK, STADELMANN & CO., LTD., London, E.C.—List No. 235, showing, particularising, and pricing their "Aureola" luminous electric radiators which are just being placed on the market for the 1905-6 season. Some very neat designs are shown, with wrought-iron, polished brass and copper, and polished curved brass frames, and polished copper fluted reflectors.

SPHERICAL METALLIC PACKING AND ENGINEERING CO., Hendham Vale Works, Harpurhey, Manchester.—A number of lists, fully detailing Redford's patent metallic packing; their continuous automatic oil and water separator and filter; a patent valve; and Redford's patent trolley-wire holder for tramways and railways.

MESSRS. T. BAUERLE & SONS, St. Georgen, Black Forest, Germany.—Mr. L. F. Brunner, 279, Romford Road, Forest Gate, E., the sole agent for this firm in Great Britain, has sent us an illustrated list of the clock work for electric counters, meters, phonographs, steam gauges, &c.

MESSRS. MAVOR & COULSON, LTD, Glasgow.—The October date card just received gives comparative load diagrams of bar and disk machines.

MESSRS. SAMUEL GRATRIX, JUN., & BROS., LTD., Quay Street, Deansgate, Manchester.—This is an excellently got up catalogue of electrical accessories and appliances of all kinds for lighting, heating and power. It consists of 112 large pages of art paper, which shows off the abundant illustrations to advantage. Opening with smaller size dynamos and motors, it proceeds to particularise a great variety of lines, including resistances, Chloride batteries, motor starters, pocket accumulators, measuring instruments, switch and fuseboards, main and other switches, ceiling roses and cut-outs, steel conduits and fittings, lampholders, brackets, Nernst lamps, arc lamps, street lighting pillars, fans, cooking apparatus and radiators, and so on.

THE LANGDON-DAVIES MOTOR CO., LTD., Southwark, S.E.—Copies of various price lists recently issued from the Press, nicely caught together in a convenient binder. These lists respectively illustrate and particularise single, two and three-phase alternating current motors, friction clutch motors, spur reduction gear, horse-power meters for alternating-current motors, "no-voltage" automatic releases, small direct-current motors and petrol engines for electric lighting. Prices and other necessary data appear in each sheet.

Philps's Heat Distributor.—This is an appliance made of ⅛-in. sheet-iron bent into V form and inserted in boiler tubes in order to lengthen the flow of the gas while adding an equal proportion to the velocity. Fast-flowing gases are considered better to give up heat to the surfaces they flow over, and this is said to be one reason why an excessive use of air is not so serious in its results as apparently it should be, for the excess of air is productive of greater velocity of flow, though exactly why this should be so is not clear, unless there is sufficient extra damper opening to permit of this increased velocity being produced by the chimney effect. The new distributor, 4 ft. long, placed in a tube compels an extra travel of 8 ft. An increase of draught must be possible, it is acknowledged, to permit of this. The change of direction of flow as the gases pass round the ends of the distributor is claimed to mix the gases and promote combustion—a claim which seems to us quite untenable. The mixing may tend to efficiency, it is true, but it is not due to better combustion. Economies of about 10 per cent. are claimed as a result of using the distributors.

E

Trade Announcements.—The British Johns-Manville Co., Ltd., have been appointed sole agents for the McGillivray system of emergency lighting for cars, trains and public buildings.

The offices of the Midland Electric Corporation for Power Distribution, Ltd., have been removed from 73, Lichfield Street, Wolverhampton, to Colmore House, Waterloo Street, Birmingham.

Messrs. W. H. Roy & Co. have commenced business at Tower Chambers, 30, Spring Gardens, Manchester, making a speciality of water-cooling apparatus. They have issued a list of their cooling stack, chimney-draught cooling tower, fan-draught cooling tower, and self-ventilating or open cooler.

Mordey Carney (Southampton), Ltd.—Meeting to be held at 8, High Street, Southampton, on November 7th, to hear an account of the winding-up from the liquidator—Mr. W. H. Rowland.

Intended Dividend.—The last day of receiving proofs for intended dividend in *re* Alex. Holland (Electrical and Mechanical Engineering Co., Farnworth, Lancs.) is October 14th, 1905. T. H. Winder, 19, Exchange Street, Bolton, is Receiver.

Admiralty Contracts.—It is reported that the British Admiralty and War Office have placed contracts in the United States, including electrical equipment for Woolwich Arsenal.

Bankruptcy Proceedings.—C. B. Harness.—The public examination of C. B. Harness, of electric belt fame, was recently held at the St. Albans Bankruptcy Court. Mr. H. Dade, who appeared for creditors, complained that a trustee had been nominated by the debtor's own solicitors, and that the committee of inspection consisted of the bankrupt's two sons and his solicitor. That, he thought, was a state of affairs which ought not to be permitted. In course of examination, Harness said he was not aware of his insolvency until involved with Mr. Dade and his client, about two years ago. His liabilities amounted to £2,845, and his assets to £2,203. He was adjudicated bankrupt in the county court of Wandsworth in April, 1900. His liabilities then were £3,000 or £4,000. No dividend was paid. Up to two years ago he acted as commission agent for the English Finance Corporation. He had a disagreement with the company, and in 1904 retired from it. The company claimed a large sum of money, which he contended he did not owe. His wife held debentures amounting to £1,100. She had an interest in the lease of the property in which the company carried on business in Oxford Street. She had a private income of her own, probably £300 a year. The examination was adjourned.

A. J. Harris, electrical engineer, Borough Mills, Bradford. The public examination took place at Bradford, on Wednesday. Debtor said that of the money which he had borrowed, over £100 was from his wife, and she got seventy shares in the company. His difficulties were due to the fact that all his capital was locked up. Mr. Mitchell lent him £500 on a promissory note at 5 per cent. in consideration of his finishing the education of his son in the business. He afterwards sought to obtain more money from Mr. Mitchell, but failed, and as he also failed in his attempt to form a limited company, Mr. Mitchell made him bankrupt. He could have paid everybody but for the vexatious action of Mr. Mitchell, who had declined to accept the offers made by him. The examination was closed.

Australia.—The Australian Customs authorities have lately given a decision to the effect that "fuse electric detonators for mining purposes" are to be classified as fuse and admitted free of import duty.

Alsace-Lorraine.—La Société de Dudelange, of Dudelangen, Alsace-Lorraine, is reported to have acquired the patent rights in the Kjellin process for the electrical manufacture of special steels.

German Imports and Exports of Electrical Machinery.—A steady increase is taking place in the exportation of electrical machinery from Germany, the returns for the seven months ending with July last showing a total of 7,755 tons, as compared with 7,688 tons in the corresponding period of last year. There has also been a slight advance in the imports of foreign electrical machinery into Germany—from 728 tons in the first seven months of 1904 to 830 tons in the seven months ending with July last.

Colliery Equipment.—Messrs. Ernest Scott and Mountain, Ltd., have secured a contract for a complete electrical equipment for main shaft sinking pumps for Messrs. Barber, Walker & Co.'s Bently Colliery, Doncaster, two Rateau turbines are being built to work with low pressure exhaust steam from the winding engines. The pumps will deliver 4,000 gallons of water per minute. The firm is also supplying a 250-kw. three-phase alternator direct-coupled on to a 300-h.p. Scott & Mountain engine for driving the motors and plant. The company is also building a large electrical plant for the Bengal Coal Co., a complete installation of electrical plant for the South Tyne Colliery, and a complete plant for the West Stanley Colliery.

An Egyptian Exhibition.—The Exhibition of British Manufactures which was to have taken place in Alexandria and Cairo at the end of this year, has been postponed until the latter part of 1906 and the beginning of 1907, the reason being, we understand, that the scheme has assumed very much larger proportions than was at first anticipated. It is proposed that the duration of the Exhibition shall be about one month in each city. As the Committee are desirous of forming an idea as to the area of ground which will eventually be required for the Exhibition, intending supporters should communicate with the secretaries, the British Manufacturers' Exhibition in Egypt, Alexandria. The London agent is Mr. D. S. Murray, 11 and 12, Foster Lane, Cheapside, E.C. It is considered that the public over there have never had a proper opportunity of knowing and seeing what can be produced in the United Kingdom and the Colonies, and therefore are unable to appreciate the excellence of their manufactures, with the result that cheaper Continental goods continue to be largely sold in the country, even in instances where the British article would very probably supersede them, were it more generally known. It is therefore thought that an Exhibition whereby British and Colonial manufacturers will be enabled to come into direct contact with the Egyptian public and trade would be of the greatest advantage to introduce and popularise those manufacturers in Egypt. At present there is great prosperity, and an enormous development of the country is proceeding, there is also an immense influx of visitors there during the winter from all parts of the world.

An Electrician's Claim.—At the Marylebone County Court, before Sir Wm. Selfe on Monday, Herbert Tombleson, an electrician, of 50, Rowallan Road, Fulham, applied for an arbitration under the Workmen's Compensation Act, in respect of an accident which occurred on October 13th, 1904, while he was working for Messrs. Leonard G. Tate & Co., electrical and mechanical engineers, of Bucklersbury, E.C. The claim was for £1 a week from April 27th. Dr. Cooney appeared for the applicant, and Mr. Scarlett (counsel) for the respondent company. Dr. B. S. Sanders, of Dawes Road, Fulham, stated that the applicant was still lame and unable to go up ladders or to stand on scaffolding, and in consequence was unfit to carry on his work as an electrician. He was in permanent pain, had transmatic anthritis in his ankles, and he (witness) considered that his incapacity would continue for two years. Dr. B. Goddard, on behalf of the insurance company with whom the respondent was insured, said that Tombleson was quite well and able to go to work if he wished. His Honour referred the matter to a medical referee.

Book Notices.—"Aetheric or Wireless Telegraphy." By R. G. Blaine; "Armature Windings of the Closed-Circuit Type." By W. Cramp. London: Biggs & Co. 2s. 6d. and 1s. 6d. respectively.

The Price of Zinc.—Those of our readers who are interested in our "Market Quotations" table have probably noticed the continued increase in the price of zinc sheets. We are informed by Messrs. Morris Ashby, Ltd., that the large demand for this metal by the Russian and Japanese naval and military authorities, for cartridge-case making, is responsible for the high price now quoted. During the Franco-Prussian war the price of zinc rose to £34 per ton, this being the record price attained. The price ruling on Wednesday last was £31 5s.

Engineering Dispute Settled.—Representatives of the Engineering Employers' Federation and delegates from the patternmakers held a private conference in Glasgow on Tuesday, with a view to ending the strike which has now lasted over 25 weeks. After a prolonged sitting, it was officially intimated that the representatives had formulated mutual terms which would permit of an immediate resumption of work. Both sides agreed to a compromise of the issues in dispute.—*The Times.*

LIGHTING AND POWER NOTES.

Bourne.—Before taking steps in regard to the lighting of the U.D. by electricity, the Council has resolved to try to obtain better terms with the gas company.

Bridlington.—The T.C. on September 28th decided to apply to the L.G.B. for a loan of £4,500 for electricity purposes.

Castleford.—The U.D.C. on September 28th decided, in view of the proceedings now being taken to forward a scheme of E.L., to apply to the B. of T. for a further extension of time for carrying out the E.L. order obtained in 1901.

Clydebank.—The machinery at the new Clydebank Dock at Glasgow is to be worked entirely by electric power, including the capstans at the dockhead.

Continental Notes.—Germany.—It is proposed to establish a municipal electricity works in the town of Scherfelde, Westphalia.

Italy.—A concession has been granted to put down a plant to utilise the water-power of the River Ghignero, in the generation of electrical energy for power purposes at Rapallo.

Russia.—According to the *Financier*, the town of Archangel has decided on a loan of 300,000 roubles for the introduction of electric lighting; but, in connection with this loan, the Government has laid down the condition that preference in the orders shall be given to home manufacturers.

Derby.—The following sliding scale of reduced charges for energy has been adopted by the T.C., the figures showing a reduction of ¼d. per unit throughout:—Flat rate: Not exceeding 2,000 units per quarter, 4½d. per unit; over 2,000 and not exceeding 3,000, 4¼d.; over 3,000 and not exceeding 4,000, 4d.; over 4,000, 3¾d. Maximum demand system: From 3d. and 3d. to 6d. and 2½d.

Eastbourne.—The Corporation is about to extend its mains to light by electricity the suburb of Hampden Park and the village of Willingdon, which is about two miles from the borough.

East Ham.—In our "Lighting and Power Notes" last week we regret that the capital expenditure on the electrical undertaking to March 31st last was stated to be £417,286. It should have been £117,286.

Epsom.—50 tantalum lamps are to be put up by the U.D.C. as an experiment in seven streets.

Exeter.—The T.C. has decided to take immediate steps to apply for a prov. order to supply energy to Heavitree.

Falkirk.—The Scottish Central Electric Power Co. has arranged to supply to the Falkirk and District Tramway Co. all the energy it requires inside and outside the burgh. An amicable arrangement has been come to between the parties by agreement, under which the Power Co. pays the T.C. the sum of £100 towards the legal and other expenses incurred by it in connection with the dispute, and the sum of £30 per annum. The Council unanimously adopted the agreement. On the recommendation of the E.L. Committee, the T.C. has resolved to reduce the price of energy for power purposes to 2d. per unit for one hour of maximum demand, 1½d. for the next two hours, and 1d. per unit thereafter, but with a minimum charge of 40s. per annum. The new rates come into force with the January term.

Fifeshire.—At the various coal pits in the Donibristle district, Fife, belonging to Mr. Nasmyth, the electric light has just been installed. A fire which has just taken place in a Scottish colliery through the upsetting of a naphtha lamp should help to induce other coalmasters to follow this example in electric lighting at Donibristle.

A new electric power station is to be erected on a site at Buckhaven, Fife. It will serve, besides public works, the new Kirkcaldy and Leven tramway.

Gloucester.—The T.C. has received from the L.G.B. sanction to borrow £11,610 for electricity purposes.

Hereford.—The T.C. has agreed to the E.L. Committee borrowing £5,300, subject to the consent of the L.G.B., for mains extensions and the purchase of electric motors for hiring out, &c.

Hipperholme.—The Halifax Corporation has offered to give the U.D.C. a supply of energy in bulk at 3d. per unit.

Hull.—The T.C. has decided to hire out electric motors.

Ingleton.—There is a conflict between electricity and gas at the little town of Ingleton. Seven years ago general dissatisfaction was expressed at the quality of the gas, and this led to the formation of an electric light and power company, who secured the contract for lighting the streets. The lamps were provided by the chairman of the electric light company (Mr. J. C. Walker), and a charge of £60 has been made for energy used in addition to repairs, which last year amounted to £9 15s. The Parish Councillors find that electrical fittings require renewal, and have been grumbling at the cost. The gas company taking advantage of this, sent in a surprise tender to light the streets for £40, or £20 less than the E.L. company. At a Parish meeting it was decided by 24 votes to 15 to support gas as a street illuminant, the company promising to bear the expense of lamp-posts, &c. The P.C. may, however, decide to adhere to the electric light.

Irvine.—A public meeting of citizens has been held, protesting against the T.C. proceeding with an electric lighting scheme.

Jedburgh.—The formal inauguration of the electric lighting of the streets of Jedburgh took place last Friday. The principal streets have been lighted for some time by arc lamps, and the system is being gradually extended through other streets in the burgh.

Kingston-on-Thames.—£4,000 has been borrowed by the T.C. from the Corporation of Reading, for E.L. purposes.

Little Lever.—The U.D.C. has decided to obtain the assistance of an electrical engineer in its negotiations with the Lancashire Electric Power Co. for a supply of energy.

London.—WESTMINSTER.—With reference to the appeal of the Westminster Electric Supply Corporation against the decision of the City Council that the covers of distribution boxes must be filled with material similar to the surrounding pavement, the Works Committee reported that it had received a letter from the B. of T. stating that the Board had appointed Major Philip Cardew, R.E., to inquire into the matter. The Committee has given further consideration to the question, and decided that, if the company will inform it how many boxes it has in stock, the municipal authority will consider as to whether it can meet the company by waiving the condition to the extent of the number of boxes already in stock.

The Westminster Electric Supply Corporation has decided that from January 1st next, the charge for energy for power, heating and cooking shall be reduced to 1d. per unit.

FULHAM.—The T.C. has not entertained the offers received for the purchase of No. 3 300-KW. set, particularly as its removal and the installation of the new 1,000-KW. set cannot be effected before the coming winter's load.

BERMONDSEY.—The borough electrical engineer has recommended the B.C. to install an additional steam dynamo and marine boiler as soon as possible; he points out that during this winter's load there will be no available spare plant.

KENSINGTON.—In view of the controversy on the question of a cheap supply of energy for power purposes in London, it is interesting to note that the Brompton and Kensington Electricity Supply Co. are now supplying electricity for power, heating and cooking at 1d. per B.T.U. We have received an attractive pamphlet from the company, which sets out the various uses for which electrical energy, at the power rate, may be adopted. Copies are being distributed among the company's customers.

G.P.O.—On the south bank of the Thames, near Blackfriars Bridge, a new power station for the G.P.O. is now being erected, the plant when installed being intended to take the place of that now working at St. Martin's-le-Grand. About 2,500-H.P. of machinery is to be installed to generate electrical energy for pneumatic tube work, lighting, lifts, fans, for working stamping and obliterating machines and for battery charging, &c.

Mexico.—An American company, hailing from the States, proposes to erect electric power plants near the city of Mexico, and to build transmission lines to supply power for operating industries there and in adjacent towns.

Newcastle-on-Tyne.—The T.C. has been recommended to apply to the B. of T. for a prov. order to enable the Corporation to supply energy to tenants in the municipal markets.

Pembroke (Dublin).—E.L. extensions are to be carried out here, the L.G.B. having recently sanctioned an outlay of £25,000 on the work. Eight additional miles of cables are to be laid and provision made for household supply. A number of the existing gas lamps will be replaced by arc lamps. The scheme, which will take about six months to complete, will be in operation before the International Exhibition is held in the Herbert Park, recently purchased from the Earl of Pembroke. The existing plant is equal to the contemplated increased output.

Radcliffe.—The U.D.C. has revised the prices for the supply of energy to private consumers for lighting and power as follows:—For lighting: Up to and not exceeding 250 units per annum, 5d. per unit; exceeding 250 and up to 500 units per annum, 4½d. per unit: from 500 to 1,000, 4¼d. per unit; from 1,000 to 1,500, 4¼d.; between 1,500 and 2,000, 3¾d.; for all above 2,000 units per annum, 3½d. per unit. For power: For consumption not exceeding 60 units per B.H.P. per quarter, 2d.; over 60 and up to 125 units per B.H.P. per quarter, 1¾d.; for all energy exceeding this latter amount, 1½d. per unit.

The opening ceremony in connection with the Radcliffe power station of the Lancashire Electric Power Co. is to be performed by Lord Derby on the 9th inst.

South Africa.—BLOEMFONTEIN (O.R.C.)—The question of electric lighting was discussed at a T.C. meeting on September 6th. The city engineer in a report estimates the cost of the station alterations at £21,877, and a further sum of £16,924 for extensions of mains, &c. Advantage is being taken of the visit of Mr. Robert Hammond to lay the scheme before him for a comprehensive report on the system and the contemplated extensions.

DURBAN.—The electrical engineer's report for the month of August states that two new B. and W. boilers at the power station have been completed and put into use, and good results are being obtained by the mechanical stokers with which they are fitted. Work on the foundations for a new alternator has been commenced.

A letter was read at the Council meeting from the Ratepayers' Association, signed by various electrical contractors, asking that all persons engaged as electrical artisans shall be required to pass a Corporation qualifying examination, and that a bye-law be framed on the subject. The matter was referred to the Electric Light Committee.

Electrical plant recently landed at Durban for tramway power and lighting purposes at Johannesburg include the largest generators ever imported into South Africa, the armatures weighing 31 tons each, while the top and bottom halves of the field magnets weigh 41 tons each. Special trucks had to be supplied by the railway department.

LOURENCO MARQUES.—While a trial was being made with the five-ton electric crane on the wharf, the crane overbalanced and fell into the sea. The engineer fortunately escaped, receiving no injury. Meantime dredging is suspended.

PORT ELIZABETH.—At a meeting of the T.C. the engineer suggested that an exhibition be promoted in order to advertise the undertaking, and that it should be held soon after the opening of the works, and last three days. It was resolved to recommend that an exhibition be held as suggested, and that a sub-committee be appointed to act with the engineer in carrying out the proposal.

JOHANNESBURG.—In regard to the notice given by the T.C. recently of the extension of electric lighting facilities at an early date, a local contemporary states that it has been found that the wirings originally fitted in many residences which had remained disused owing to the inability of the authorities to supply energy, have become useless, and, in many cases, dangerous. Refitting is, therefore, the order of the day.

Southampton.—In regard to the arrangements for the holding of an electrical exhibition in the borough, the electrical engineer expressed doubts as to the Committee being able to secure the Skating Rink for such a purpose, owing to the previous letting of the building. It was resolved that, failing the possibility of obtaining the Skating Rink in November for the purposes of an exhibition, the subject be postponed until March, or until the Rink may be available.

Southport.—An electrical exhibition, organised by the Corporation Electricity Committee, is to be held at the Cambridge Hall, from November 10th to 17th inclusive, for the purpose of bringing before the public the developments in electricity for lighting, heating and power. We understand that the greater part of the space has already been taken up, and that an endeavour is to be made to obtain a few of the specialities now on exhibition at Olympia.

Sutton Coldfield.—On Oct. 3rd, a L.G.B. inquiry was held into an application of the T.C. to borrow £8,000 for E.L. purposes. In inquiring into the details of the present application, the inspector expressed surprise that certain plant had been erected in 1904, and five months allowed to elapse before any application was made to the board for a loan to cover the cost. The Chairman of the Committee explained that this was accounted for by a breakdown at the depôt. Lieut.-Colonel Walker (representative of the Walmley Ward) objected to the proposed loan on the ground that his ward was agricultural and would not benefit by the electric light. Mr. King (Walmley) supported this view, and Mr. Morris (Wylde Green) said he should not oppose the loan, because the money had already been spent, but he strongly disapproved of it.

Tunbridge Wells.—A resolution against the proposed sale of the electricity undertaking was passed at a meeting of the T.C. on Wednesday last by 17 votes to 7.

Warrington.—On September 28th a L.G.B. inquiry was held respecting the Corporation's application for a loan of £3,000 for E.L. purposes, this being for lighting cables. There was no opposition.

Willesden.—In accordance with the agreement between the U.D.C. and the North Metropolitan Electric Power Supply Co., a complete statement of receipts and expenditure in connection with the electric lighting undertaking for the second year of working has been submitted to the Council. The receipts totalled £14,403, of which £10,579 was received from private consumers, £2,920 for public lighting, and £409 for rent of meters. The expenditure was £14,033, of which £6,514 was paid for the purchase of electricity in bulk, £1,510 for management expenses, £723 for distribution of electricity, £446 for public lamps, £423 for law and parliamentary expenses, and £186 for rent, rates and taxes. Allowing £59 for bad debts, the net profit on the second year's working was £510, as against £177 in the first. In calculating the net profit on the second year's working at £310, the company are not credited with the sum of £153 interest which had accrued upon the suspense account.

The Metropolitan Electric Supply Co. has withdrawn notice of appeal to the House of Lords against the decision of the Court of Appeal confirming the judgement of Mr. Justice Farwell, in the action brought by the Attorney-General at the instance of the Council. The defendants will have to pay the taxed costs of the Council. In July last, a suggestion by the consulting electrical engineer that owing to the low rate at which energy is purchased in bulk for public lighting, 50 additional arc lamps be erected, was referred to the Electricity Committee. This committee now reported that the total amount paid for public lighting in the year 1904-5 was £2,920, which was equal to an average £20 17s. each for the 140 arc lamps already erected, and recommended the adoption of the proposal of the consulting electrical engineer. The total number of 190 lamps would thus work out at the low rate of £15 7s. each. The recommendation was adopted.

Windsor.—Messrs. Foote & Milne, Ltd., who are applying for power to supply energy to Sunninghill and Sunningdale, have informed the R.D.C. that they will supply the Council or the two Parish Councils with energy for public lighting at 5d. per unit, and ordinary consumers at 6d.

Woodhall Spa.—The U.D.C., which contemplates spending £5,000 on the erection of gas works, has requested Mr. Skinner, of Messrs. Berry & Skinner, London, to submit proposals for electric lighting. Mr. Skinner informs the Council that an electrical installation of 1,000 lights could be put down for about £3,000.

TRAMWAY AND RAILWAY NOTES.

Australia.—We have been favoured by the Electric Supply Co. of Victoria, Ltd., with a souvenir tram-ticket (postcard size) of the opening of the Ballarat electric tramway system on August 18th. Small views of the power station interior and exterior and of a tramcar are embodied in the design of the card.

Berlin.—The recent rumours circulated in regard to new schemes proposed by the Berlin Grand Tramway Co. have resulted in the issue of an official statement relating to the projects which the company, in association with the Charlottenburg Tramway Co. and the western and southern local lines, hopes to be able to carry out, subject to certain conditions. What the company proposes is the execution of two large schemes for relieving the surface traffic along two of the main arteries of traffic in the centre of the German capital, by abandoning the existing electric tramways on the street level and substituting underground lines. The first relates to the construction of an underground line from the Potsdam Bridge *viâ* the Potsdam Place and along the Leipsig Strasse to the Spittelmarkt, and four tracks would be provided for the greater portion of the route. The second project suggests a double track underground line from the Siegesallee in the Charlottenburg Chaussee and along Unter den Linden to the Opera Place. It is estimated that the cost of executing the works would amount to £3,000,000, and the companies are prepared to proceed with the enterprise on condition that their concessions, which will terminate on December 31st, 1949, are extended so as to comprise a period of 90 years, or the same duration as that of the Underground and Elevated Electric Railway Co. Applications have been made to the local authorities as to the conditions under which they would be ready to prolong the concessions enjoyed by the companies. To some extent the two schemes clash with other, or portions of other, projects promoted by the Municipal Council and by the Underground and Elevated Railway Co., and it will therefore be surprising if the tramway companies succeed in securing approval of their projects.

Bournemouth.—The residents are engaged in a violent controversy as to the propriety of running tramcars on Sunday. The opponents seem to be in doubt as to whether their objections are based on Sabbatarian principles or commercial considerations; but feeling is running high, and the question will affect the November elections.

Bradford.—The working of the municipal tramways at Bradford has lately been the subject of investigation by a special sub-committee of the Tramways Committee, at the request of the general manager (Mr. C. J. Spencer). The inquiry was asked for on account of certain criticisms on the organisation and efficiency of the system. The sub-committee says that it has arrived unanimously at the conclusion that, as regards working and organisation, the Bradford Corporation tramways compare favourably with any other large system in the country. The Committee recommends that the permanent way and all staff connected with maintenance or construction should be under the control of the Tramways Committee through its manager; also, as the permanent way absorbs 60 to 70 per cent. of the total capital expenditure, and its upkeep and maintenance are likely to be a most serious item in connection with the tramways system, the spending of all money should be under the control of the officer who is responsible to the Tramways Committee for financial results. The accounts should be kept in such a way that the general manager would be able to obtain the fullest information as to costs, &c., at all times.

The sub-committee made some interesting and exhaustive inquiries at Sheffield, Manchester, Leeds and Glasgow into the subject of accident claims. At Sheffield for the year ending December, 1904, 1,722 accidents of all kinds happened with a car-mileage of 5,997,063; 215 claims were made, and £470 7s. 8d. was paid for compensation. In Bradford for the year ending March 31st, 1905, 1,739 accidents occurred, 238 claims were made, and £4,600 was paid in compensation, with a car-mileage of 5,053,392. At Leeds £2,090 was paid on a car-mileage of 7,044,745 for the year ending March 31st, 1905. At Glasgow £18,000 per annum was paid in insurance against third party risks, and in Manchester £11,000 had been paid for the last 12 months as claims, with a car-mileage of 13,759,071.

The most striking difference is between Sheffield and Bradford, and the general manager of the Sheffield Tramways attributes this chiefly to the institution of a claims department, under the control of a claims superintendent at a salary of £225 per annum. Practically full power is given to this superintendent to settle all claims, and in this way it has been found that claims are settled far better and more expeditiously than under the old system. At Manchester, practically the same system is in operation. In Leeds the system is very similar to that in Bradford. The general manager considers the claims, which pass through the hands of a claims clerk, and in the event of the matter getting into the hands of a solicitor, it is passed over to the town clerk. The general manager of the Leeds Tramways has expressed the opinion that this system of handling claims is not quite so satisfactory as it might be, and possibly some alterations will have to be made.

Cardiff.—The report of Mr. Arthur Ellis for the year ended March 31st last, shows that the total revenue amounted to £112,209, and the expenditure to £112,189. The latter included loan charges of £37,887, and £2,605 for insurance. The gross profit was £39,751, equal to 5½ per cent. on the capital outlay, £726,377.

Coventry.—A serious accident occurred on the Coventry and District Electric Tramways at Foleshill, on Wednesday last week, in a dense fog. Two cars left Coventry and Bedworth respectively at seven o'clock. Through a misunderstanding the car from Bedworth did not wait in a siding at New Inn Bridge for the arrival of the Coventry car, the result being that they ran into one another. Both cars sustained considerable damage, but no one was seriously injured.

Croydon.—The T.C. is considering the renewal of the lease of the tramways to the British Electric Traction Co., for which the latter paid £16,000 a year, and now offers £4,000 more. The proposed new lease will last for 7, 14 or 21 years. The

socialist Press is urging the T.C. to retain the tramways in its own hands, to secure the profits for the ratepayers, but whether the Council could secure a profit greater than £20,000 a year is a problem not difficult of solution. The company has powers to construct tramways in the districts round Croydon, and is in a far better position than the Council to work the joint system to advantage.

Dudley.—At a meeting of the T.C. in committee recently, a letter was read from Mr. E. Garcke in reference to the purchase by the Corporation of the tramways within the borough. In this communication Mr. Garcke explained that with reference to the terms of the settlement suggested on behalf of the Dudley Corporation, Mr. Hilton, Mr. Lycett and himself had given them very anxious consideration, and they had no doubt that their acceptance would prove disastrous to the companies. The town of Dudley had derived vast benefits during the past few years from the development of electric traction, while the average return on the capital invested had been only 4½ per cent. per annum. They thought, under these circumstances, it was a very great hardship on the companies that the Dudley Corporation should seek to impose upon them such terms as would effectually prevent the directors from carrying on the business with satisfaction to the public and the shareholders; and if the Corporation was determined to exact the proposed onerous and impossible terms from the companies to the full extent provided by the draft agreement, they had no alternative but to leave them the responsibility of having the matter decided by arbitration. As a result of the discussion which followed the reading of this letter, it was decided that in accordance with the recommendation of the Tramways Committee, arbitration be proceeded with.

Falkirk.—The Falkirk electric tramway system will be inaugurated within the next few days. The car-sheds, which provide for the accommodation of 20 cars, are situated between Falkirk and Larbert. The cars, which have been made in France, are of the double-decked type, and have a seating capacity for 50 passengers. There has been erected in the vicinity of the sheds a sub-station, the energy being supplied by the Scottish Central Electric Power Co. from their works at Bonnybridge at 3,000 volts. In the sub-station it is converted by two large motor-generators. The contractors for the entire undertaking are Messrs. Bruce Peebles and Co., Ltd., Edinburgh.

Glasgow.—The Tramways Committee has referred deputations from outside districts, asking for the extension of the tramways, to their respective County Councils. In the case of Clydebank, the Glasgow Corporation is bound to rebuild two bridges over a canal, and the burgh wants them widened at the same time; a deadlock has arisen as to the payment of the extra cost.

The Committee has refused to vary its charge of 1d. per unit for electricity supplied to the Electricity Department.

Houghton-le-Spring.—The section of the Sunderland District Electric Tramways joining the urban townships of Houghton-le-Spring and Hetton-le-Hole is now practically completed, and it is hoped that the cars will be running in a day or two. Houghton-le-Spring, although a place of considerable importance, has no rail connection, except that furnished by means of the tramways which will give communication with Fence Houses and Hetton-le-Hole stations on two different branches.

London.—Over the Bridges.—The City Corporation has referred a communication from the L.C.C., inviting the former to obtain Parliamentary powers to widen or rebuild Blackfriars Bridge, to the Bridge House Estates Committee, with power to employ expert assistance, and to confer with the L.C.C.

Paddington.—At the meeting of the B.C. on Tuesday, a letter was received from the Harrow Road and Paddington Tramways Co., submitting statements, plans and sections, and giving notice that, in the exercise of their powers under the Act, they intended to commence the execution of the work of reconstructing their lines for electric traction. It was resolved to inform the company that, inasmuch as they had not complied with their Acts as regards the deposit of sufficient explanatory notices, plans, sections and statements, the Council could not approve of the plans, sections and statements which had been deposited. The General Purposes Committee recommended that the L.C.C. be informed that the B.C. will be prepared to favourably consider a scheme for running tramways along the Edgware Road, provided that the cost of the necessary street widenings is borne by the L.C.C. as part of its tramway policy, and subject to clauses being inserted to the satisfaction of the B.C. The consideration of the matter was adjourned.

Westminster.—The City Council has received a notification from the B. of T. that they have approved of the plans lodged by the L.C.C. for the electrification of the tramways in Vauxhall Bridge Road and across Vauxhall Bridge.

Chelsea.—The B.C. has received notice from the London United Tramways (1901), Ltd., of the company's intention to break up roads for the purpose of laying cable.

Wandsworth.—Messrs. Stanley & Co., solicitors to the London United Tramways Co., wrote relative to the conditional sanction given by the B.C. to the laying of electric cables from Lot's Road, Chelsea, through Fulham and Wandsworth to Wimbledon. The company refused to agree to the condition which would bind them to remove at their own expense the cables and ducts, if these were required to be shifted at any time in connection with the works of the Council. The B.C. decided not to insist upon the condition.

Malta.—On Saturday last an accident happened on the electric tramway recently opened at Valetta. In consequence of the brakes refusing to act while descending a hill, the car dashed into a wall at a curve half way down. Five men were killed and 23 persons were injured, six of them seriously.

Neasden.—Doubtless as the result of the recent agitation, the Willesden U.D.C. has informed the Coal Smoke Abatement Society that it has resolved that further proceedings be taken against the Metropolitan Railway Co. and the British Westinghouse Co. to enforce the recurring penalties for which they are liable for the emission of smoke under Section 98 of the Public Health Act, 1875.

Newcastle-on-Tyne.—The annual report of the general manager of the Newcastle-on-Tyne Corporation tramways has just been issued. This shows that the total length of tramways worked by the Corporation was on March 31st 49¾ miles within the City owned by the Corporation, 1¼ miles in the borough of Wallsend, and 3½ miles in the urban district of Gosforth, both of which sections are owned by the Tyneside Tramways and Tramroads Co. The total revenue was £197,493, and the working expenses £126,338, giving a gross profit of £71,155. The net balance, including £3,600 from last year, was £9,955. The number of passengers was 43,069,934, and the number of car-miles travelled was 4,326,152. The percentage of working expenses to receipts was 64, and the total revenue per car-mile averaged 10·96d. The average journeys per head of population per annum were 143. The chief items of expenditure were as follows:—Wages of drivers and conductors, £42,553; superintendents, £1,479; other traffic employés' wages, £5,388; cleaning and oiling cars, £7,978; ticket check, including inspectors and clerks, £4,640; salaries of general officers and staff, £3,153; rates and taxes (excluding income tax), £6,860; repair and maintenance of permanent way, £7,914; maintenance and repair of electrical equipment, £2,066; cars, £10,186; salaries and wages at the power house, £4,312. The statement of capital expenditure showed an outlay of £1,120,867. The report mentions that 20 of the single-truck double-deck cars have been built in the Corporation workshops, and two single-truck double-deck cars are now in course of construction, in addition to which the staff are now engaged on building covered tops for 20 cars.

Ramsgate.—The B. of T. has fixed Friday, the 13th inst., as the date of the adjourned inquiry into the Ramsgate tramway accident of August 3rd, when a tramcar went over the East Cliff. The inquiry was adjourned for the evidence of the driver, who was too severely injured to be available.

Rochester.—The Corporation has decided to extend the present electric tramway system from Star Hill to the Maidstone Road and the Grange. This will give a direct electric tramline from the Grange right on to Chatham and Gillingham, a distance of some six miles. Later on it is proposed to go on to Borstal, where there is a large convict prison and a well-populated working-class district.

Scotland.—New tramways are well in evidence in Scotland at present. The Falkirk line will be opened in a few days. At Wemyss, Fife, the new tramway between Kirkcaldy and Leven is well in hand, and at Musselburgh so successful has the new line been that Mr. E. A. Mitchell, chief engineer of the National Electric Traction Co., Ltd., London, is surveying the route east of Prestonpans with the purpose of extending the journey fully 5 miles. Negotiations are in progress for a tramway between Hamilton and Low Waters.

Siam.—Reuter says that the King of Siam on Tuesday opened 20 kilometres of electric tramways at Bangkok.

South Africa.—Durban.—In connection with the municipal tramways, the rolling stock has been increased by the arrival of six trailers, supplied by Messrs. Milnes, Voss & Co., who built the cars, and Messrs. Mountain & Gibson, of Bury, who built the underframes and trucks, which are of the "radial" type. The seating capacity is for 32 passengers, and the cars are fitted up similarly to the existing cars, the cost of each being about £430. A proposal is being brought forward for the collection and delivery of parcels by the cars, on similar lines to those instituted by Mr. Thomas when at Huddersfield, and it has been further suggested to have post boxes also fitted.

South Shields.—The Tramways Committee has been further considering the question of appointing a manager for the new electric system now in course of construction. The Committee had recommended Mr. J. H. Cawthra, the electrical engineer, for the position, but the Council, at its meeting, remitted the subject back for further consideration. Having looked into the question, the Committee re-affirmed its decision to appoint Mr. Cawthra.

Tipton.—The tramway difficulty has been at last amicably arranged. At a meeting of the U.D.C. last week the terms, it was stated, were that the company undertake within three months of the sealing of the agreement to electrify the line from Dudley to the Bull's Head Inn, Prince's End, and also in the same period to reconstruct and electrify the tramway from the Wednesbury boundary to Ocker Hill railway station. The intermediate portion, where the mining subsidences are now taking place, is to be electrified and reconstructed within 18 months from the sealing of the agreement. In addition, the tramway company undertake to pay to the Council £150 for the watering of the track up to April 3rd next, and £110 per annum in advance from that date; also to pay all the costs of every kind which the Council has incurred.

The British Electric Traction Co. have consented to become guarantors under the supplementary agreement, as they are under the original agreement. The Council considered the agreement satisfactory, and passed the plans submitted for its carrying into effect.

United States.—New York City.—Contracts for the new electric subways are expected to be advertised after January 1st, 1906. The routes so far approved include lines under Lexington, Third, Seventh and Eighth Avenues, with connections on the south with Brooklyn, and on the north with Bronxborough. The Inter-State Tunnel Railway Co., organised on September 21st, is proposing to build still another tunnel under the Hudson River to connect Manhattan City with the New Jersey suburban towns, and promises an express service to Newark in 15 minutes. The New Jersey end of the tunnel will be connected with a system of electric traction aggregating some 550 miles.

Mr. Harry P. Nicholls, an engineer in the employ of the city, in reporting to the Bureau of Franchises, uttered a warning against allowing traffic conditions to get beyond the control both of the city and the traction companies. There was one point, he said, in Brooklyn where at certain times of the day 583 cars per hour were supposed to pass, or at the rate of 10 per minute; under these conditions a speed of more than 3 or 4 miles an hour was impossible.

Long Island.—The Manhattan and Long Island Railway Co., recently organised with a capital of £2,000,000, proposes to operate an electric railway 80 miles long, starting from the New York end of the Blackwell's Island Bridge (not yet constructed), and extending as far north as Oyster Bay, the summer residence of President Roosevelt.

TELEGRAPH AND TELEPHONE NOTES.

Amazon Telegraphs.—"The Valley of the Amazon and its Telegraphic Communication" is the title of a brochure written by Mr. Francisco Bhering, of the Brazilian Telegraph Administration, and also the Delegate of Brazil at the London Telegraph Conference. It is stated therein that, with the view of assuring regular communication, the following lines were provided:—(1) A landline along the railway from Mederia to Momare. (2) A cable across the river from Belem to Manaos. (3) Landlines along the banks of the river, and serving as auxiliary lines to the British river route. (4) Landline from Caqueta to the mouth of the river Aquiry. (5) Wireless telegraph installation at various points along the Amazon and some of its chief affluents.

The first and fourth lines have completely failed. The river line of the Amazon Co. has not, the brochure states, given the good results hoped for. The irregularity in working of the cable, which is frequently interrupted between Para and Manaos, considerably interferes with commerce. . . . . Experience has also shown that it is not possible to keep the aerial line in good working order, by reason of floods and difficulties of maintenance.

The auxiliary routes constructed by the Amazon Co. also did not prove successful. It has been decided to try the American system of wireless telegraphy, and the author thinks this cannot be taken, excepting as auxiliary to the existing systems. At the same time, Mr. Bhering states that he does not think it possible that communication can be maintained by cables, owing to the incessant changes in the depths of the river.

Australia.—The Postmaster-General has approved of tenders being invited for a new telephone switchboard and equipment, to be placed in the new Post Office building at Hobart, as recommended by Mr. John Hesketh, electrical engineer of the Queensland Postal Department. This covers the provision of a metallic circuit for each telephone with a common battery system.

Glasgow.—The underground telegraph between Glasgow and London is approaching completion. The cables are now being placed in their permanent position within cast-metal pipes, as far north as Hamilton.

Guernsey Telephones.—On Tuesday the official inauguration of the new multiple switchboard was performed by Sir Henry Giffard, K.C., Bailiff and President of the States of Guernsey. Luncheon followed at the Old Government House Hotel.

Hull.—The town clerk of Hull has received an important letter from the Postmaster-General with respect to the future of the municipal telephone undertaking. The Corporation asked for the renewal of its licence, or for the purchase by the Post Office of the whole of the plant in 1911. The Postmaster refused to comply with either of these requests, and suggested that arrangements should be made to avoid further duplication and secure consolidation of the National and Corporation systems before 1911. As an alternative, he said he was perfectly ready to negotiate for the sale of the telephone service to the Post Office.

Submarine Cables.—The c.s. *Colonia*, which went ashore at Fox Island while laying the Canso-Port au Basque cable, and has since been repaired, has, says the daily Press, arrived at a point 187 miles from Ireland, where she has to make the final splice with the cable laid westward from Ireland. The *Colonia* laid the cable across the Atlantic. This cable is the fifth laid by the Commercial Co.

Mr. Pierre Jouhannaud has written a book on the "Protection of Submarine Cables in Times of Peace and War." It may be obtained from L. Larose & Forcel, Paris.

It is announced that the Commercial Pacific Cable Co. has secured the necessary concessions to enable it to establish direct telegraphic communication between the United States and China and Japan. It is intended to lay a cable from Guam to Yokohama and another from Manila to Shanghai.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Trinidad-Demerara (No. 1)	Aug. 26, 1901	..
Dominica-Martinique	May 7, 1902	..
St. Lucia-Martinique	May 7, 1902	..
Cayenne-Pinheiro	Aug. 13, 1902	..
Reissa-Issa (Yemen) Camaran	Oct. 22, 1902	..
Tarifa-Tangier	Jan. 18, 1904	..
Closed { Vladivostock-Nagasaki	Feb. 9, 1904	..
Closed { Port Arthur-Chifu	Mar. 9, 1904	..
Jamaica-Colon	Jan. 5, 1905	..
Cadiz-Tenerif	July 20, 1905	..
Landlines.		
Puerto-Barrios	July 28, 1902	..
Kertch-Soutehoum	Sept. 27, 1904	..
Alaska landlines	Sept. 23, 1905	Sept. 30, 1905
Communication with Brazil *via* Galveston	July 18, 1905	..
Rome-Constantinople	Sept. 22, 1905	Sept. 27, 1905

West African Telegraphs.—New telegraph offices have been opened for service at Yegi, Gold Coast, and at Warri, Sapeli and Benin City, Southern Nigeria.

Westminster.—The Works Committee of the City Council reported on Tuesday having considered a letter from the Secretary of the General Post Office with reference to the Council's refusal to sanction the erection on the public way near Hyde Park Corner of two test pillars for telegraphs, and stating that the suggested alternative of placing these inside the Park railings was not feasible as it would entail the diversion of large cables, and, moreover, access to the pillars would often be required when the Park was closed. It was asked that as the erection of the pillars is regarded as of great importance from a telegraph engineering point of view, and would lead to fewer openings of street boxes for testing purposes, the Council would give the application further and more favourable consideration. The Committee reported that having again gone into the subject, it could not see its way to depart from its previous decision.

Wireless Telegraphy.—The Chicago police are constructing a new headquarters building, 10 stories high, and are fitting up a wireless telegraphic station on the roof. Receiving stations for the wireless messages will be established in different parts of the city.

The Jury of Award at the Liége Exhibition has given the highest award—the Grand Prix—to Marconi's Wireless Telegraphy Co., Ltd., for its exhibit of wireless telegraph apparatus.

CONTRACTS OPEN AND CLOSED.

OPEN.

Barnes.—October 10th. Condensation water purifier and grease eliminator for the U.D.C. electricity works. See "Official Notices" September 29th.

Bournemouth.—October 16th. Two passenger lifts on the East and West Cliffs for the T.C. See "Official Notices" September 29th.

Bridlington.—November 1st. One 200-kw. steam dynamo, pipework and switchboard extensions for the Corporation. See "Official Notices" to-day.

G. W. Railway.—October 16th. Stores for one year. See "Official Notices" September 29th.

Leeds.—October 11th. Wiring and installation of subway, and underground concentric mains for the Pump House and Imbecile Wards at the Workhouse. See "Official Notices" to-day.

London.—October 25th. Wiring and fittings for the electric lighting of the Bandstand on Victoria Embankment Gardens for the L.C.C. See "Official Notices" to-day.

Metropolitan Railway.—October 9th. The directors invite tenders for the supply of general stores during 12 months ending October 31st, 1906. Manufacturers and others desirous of tendering should apply to the secretary (Mr. R. H. Selbie), 32, Westbourne Terrace, W., for a form or forms under the following numbers:—

18. Electric lamps, carbons, ebonite, fuses, &c.
19. Electric wire casings, and wood wool.
20. Electric wires and cables.
45. Telegraph fittings, battery jars, zincs, insulators, &c.

Mussoorie (India).—October 23rd. Supply and erection of steel power pipes, water motors, alternators with exciters, switchboards complete, transformers, induction motors, pumps, workshop machines; also bare copper overhead mains, insulators, and lightning arresters, arc and incandescent lamps, telephone equipment, workshop tools and general stores. See "Official Notices" July 14th.

Spain.—October 14th. The Spanish Ministry of Public Works in Madrid is inviting tenders until October 14th, for the concession for the construction and working of an electric tramway in Saragossa. Particulars may be obtained from, and tenders are to be sent to, El Ministerie de Obras Publicas, Madrid.

Worksop.—October 18th. One 36-KW. steam balancer, and one water softener for the U.D.C. See "Official Notices" to-day.

CLOSED.

Barking.—The U.D.C. has accepted the tender of Messrs. Crompton & Co., Ltd., for the supply of electric motors for hiring out.

Bermondsey.—The B.C. on Tuesday received the following tenders for wiring the St. John's Girls' School premises and providing fittings:—

B. E. Nightingale	(accepted)	£84 0
E. P. Allam & Co.		102 0
A. W. Penrose & Co.		112 15
T. Potter & Sons		127 10
G. W. Green & Co.		140 10
Sunderland & Co.		145 0

Burnley.—The B.G. have accepted the tender of Messrs. H. A. Jackson & Co. for the supply of electrical requirements to the workhouse, for the ensuing half-year.

Chester.—The T.C. has accepted the tender of the Sunbeam Lamp Co., Ltd., of Gateshead, for the supply of 3,000 incandescent lamps, at £100.

Dartford.—The U.D.C. has accepted the tender of Messrs. Johnson & Phillips, Ltd., for the supply of cables, at £109, and that of the Vacuum Oil Co. for cylinder oil, at 2s. 8d. per gallon, crank chamber oil, at 1s. 4½d., and dynamo oil, at 1s. 7d., for the electricity works.

Derby.—The T.C. has accepted the tender of Messrs. Milnes, Voss & Co. for the supply of six tramcars complete with top covers, at £3,745, and that of Mr. Wm. Walkerdine for the extension of the car-sheds, and the erection of a sand drying shed, at £2,299.

Durban.—The Electric Light and Power Committee recommended the acceptance of the lowest tenders for the supply of 2 miles 19/16 H.T. c.c. cable, 1 mile 7/14 H.T. c.c. cable, 1½ miles ·2 sq. in. L.T. single cable, and 400 yards ·3 sq. in. L.T. single cable, from the following firms respectively, viz, Western Electric Co., £475, Henley's Telegraph Works, £183, Western Electric Co., £376, and Messrs. Glovers, £83, totalling £1,117; and also one mile of triple-concentric cable from the Western Electric Co., for the sum of £345. Messrs. Etlinger Bros.' tender for 30-ft. poles, at £3 10s. each, was also accepted.

France.—The French Post and Telegraph authorities in Paris have lately given out contracts as follows:—La Société Industrielle des Telephones, Paris, 100 kilometres submarine cable core, at 1,437 fr. per kilometre; the India-Rubber and Gutta-Percha Co., of Persan-Beaumont, 100 kilometres ditto, at 1,430 fr. per kilometre, and 16 kilometres ditto, at 2,004 fr. per kilometre; Messrs. Stein & Co., 50 tons of iron wire, 2½ mm. diameter, at 338 fr. per ton; Messrs. Marcellot & Co., of Eurville (Haute Marne), 10 tons ditto, 5 mm. diameter, at 313½ fr. per ton, and 50 tons ditto, 7 mm. diameter, at 314 fr. per ton; Les Forges de Commercy, 100 tons ditto, at 317½ fr., and La Société Metallurgique de Gorcy, 200 tons ditto, at 316½ fr. per ton.

Glasgow.—The sub-committee of the T.C. have recommended for acceptance the following offers:—

Navvy barrows, Messrs. Butter Bros.
Cast-iron brackets and enamelled plates, Messrs. P. & R. Fleming Co.
Pitch pine sleepers, Messrs. Buchanan & French.
Haskinising of pitch pine sleepers, Messrs. the Scottish Wood Haskinising Co.
Galvanising wires, Messrs. Allan, Whyte & Co.
Tram rails, 1,500 to 2,000 tons straight track, and 150 tons curved, Messrs. Bolckow, Vaughan & Co., Ltd.
Armoured cable, Messrs. W. T. Henley's Telegraph Works Co., Ltd.
Cross-overs for permanent way, the Lorain Steel Co.
Automatic sprinklers for Coplawhill Car Works, Messrs. Watson Bros.
Traction street poles, Messrs. Wilson, and Union Tube Co., Ltd.
15,000 tons of granite setts, the Welsh Granite Co., Ltd.

Halifax.—The Tramways Committee has this week given an order for one of Parr's automatic electrical point controllers, at £75.

Leicester.—Messrs. S. Dixon & Son, Ltd., have secured a third repeat order for ten Turner's patent point controllers for the Corporation.

Marylebone.—Messrs. Arc Lamps, Ltd., have received large orders for the change-over at Marylebone, some 150 lamps having been ordered by Messrs. Duncan, Watson & Co., of Charing Cross Road, London.

Pembroke (Ireland).—The following tenders for the extensions of the electricity supply undertaking have been accepted by the Electric Lighting Committee of the D.C.:—

M.—Electricity supply mains, Callender's Cable and Construction Co., Ltd.	£14,624 18
N.—Arc lamps, pillars and Accessories, W. Lucy & Co., Ltd.	1,132 10
O.—House Meters, Chamberlain & Hookham, Ltd. ..	At schedule rates
P.—Extension of switchboard, Nalder Bros.' & Thompson, Ltd.	472 0

Poplar.—The B.C. Electricity Committee has exercised its option to take from the Whitwell Coal Co. 3,500 tons of coal, at 10s. 9d. per ton, to be supplied to the electricity works during the next six months.

Swansea.—The Swansea Tramways Co. has ordered six single-deck car-bodies, mounted on Brush maximum traction trucks and fitted with Brush 1,002B motor equipments; also four double-deck car-bodies with radial trucks and 1,002B Brush motor equipments, from the Brush Electrical Engineering Co., Ltd.

Willesden.—The U.D.C. has accepted a tender from Messrs. Ferranti, Ltd., at £303, for alterations to, and extension of, the switchgear.

FORTHCOMING EVENTS.

To-day's Events.—At Olympia, Mr. J. Swinburne. Lecture on "Domestic Electric Lighting."
Monday, October 9th.—Institution of Mech. Engineers (Graduates), "Work in a Locomotive Running Shed," by Mr. C. C. B. Morris.
Tuesday, October 10th.—At Olympia, "Electricity Meters." Lecture by Mr. S. Z. de Ferranti.
Wednesday, October 11th, at 7 p.m.—Dinner of the "Dynamicables" at the Electrical Exhibition, Olympia.
At Olympia. Lecture on "Electric Heating," by Mr. H. J. Dowsing.
Friday, October 13th.—At Olympia. Lecture on "Electric Telegraphs," by Mr. A. Martin.
Friday, October 20th.—First Smoking Concert of the Electro-Harmonic Society.
Tuesday, November 7th.—At 8 p.m. Institution of Civil Engineers. Inaugural Address by the President, Sir Alexander R. Binnie. Presentation of the Council's Awards, and Reception in the Library.

THE ELECTRICAL ENGINEERS R.E. (VOLS.).

THE following orders are announced:—

Monday, October 9th.—Officers' monthly dinner at Lyons' Restaurant, Victoria Street.
Friday, October 13th.—Woolwich detachment parade at R.A.M.C. (V.) Hall, Brook Hill Road, 8 p.m. Dress—Uniform, if possible; working dress in forage caps without arms.
Saturday, October 14th.—The last shoot for this year will be held at Runnemede all day. Ammunition supplied on the range.

WILFRID C. DUMBLE, Captain R.E.
For O.C.E.E.R.E. (V.)

Civil and Mechanical Engineers' Society.—ANNUAL DINNER.—On Thursday last week the annual dinner of this Society was held at the Restaurant Frascati. The President, Mr. Alfred Hanssen, occupied the chair, and amongst the guests were Mr. W. B. Esson (president elect), Mr. R. H. Willcocks, Mr. R. L. Matthews, Mr. J. C. Osborne, and others. The arrangements for the entertainment were in the hands of the Hon. Sec., Mr. A. S. E. Ackermann, and were, as usual, unexceptionable. The toast list was reduced to the minimum; the President proposed the loyal toasts, which were duly honoured, and Mr. J. C. Osborne proposed "The Society," in a brief speech. Mr. W. B. Esson's reply was equally brief, but, as might be expected, was humorous while it lasted. It is impossible for Mr. Esson to lose sight of the humorous side of things, or for his audience to refrain from joining in his amusement thereat.

A recitation and several songs were admirably rendered by Miss Fruen; Mr. G. Robins performed a prodigious feat of memory, and gave sundry imitations, and Dr. J. S. Owens contributed some conjuring tricks. The evening passed off pleasantly, to the satisfaction of all concerned.

Tramway Manager Sentenced.—At Devonport on 29th ult., J. W. Endean, late manager of the Devonport and District Tramway Co., was sentenced to six months' imprisonment for embezzling various sums paid to him on behalf of the company for season tickets. It was stated that prisoner issued 47 tickets, for which he received £4 10s. each, and two for which he received £3 10s. and £2 15s., and the money had not been accounted for. He was re-arrested at Swansea, where he was aboard an outward bound liner.

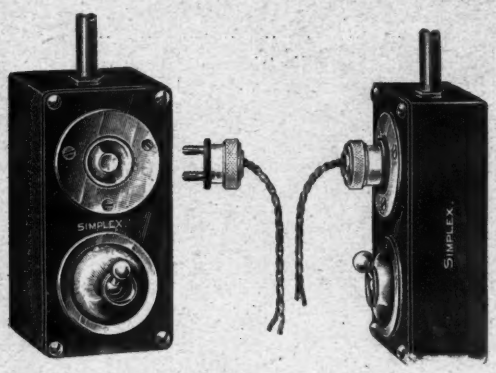
THE OLYMPIA ELECTRICAL EXHIBITION.

(*Continued from page* 510.)

The Simplex Steel Conduit Co.

The Simplex Co.s' stall forms an object lesson in the wonderful adaptability of the firm's well-known steel conduit.

The wiring man is probably well enough acquainted with the



Figs. 26 and 27.—Sunk Socket and Switch Fitting.

Simplex manufactures by this time, but as developments are continually being made, he will be well advised to spend some time at this stall.

Among the novelties will be found the Simplex sunk wall

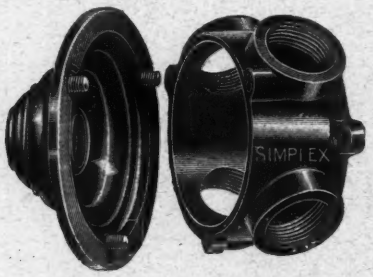


Fig. 28.—Simplex Pendant Box.

socket and switch fittings, which have been introduced for use in buried work, where it is required that the switch or wall socket shall come flush with the plaster.

Another fitting for use in connection with concealed work is a combined switch and wall socket box. The iron box is of convenient size and is fitted with insulating or metal cover, fixed by four brass screws. The switch is provided for top connections to facilitate wiring. It often occurs in practice that the wireman may not install the length of conduit leading up to the switch and wall socket box quite straight, and therefore the latter also becomes out of truth, and is unsightly. The Simplex Co. has introduced an adjustable box which allows of the metal cover, which appears on the surface being easily put in line, and this will be found to greatly facilitate wiring. Simplex "station" boxes for use as junction bracket or pendant boxes, have already gained great popularity amongst consulting engineers and contractors who prefer a heavy watertight form of box to the lighter types usually installed. They are particularly adapted for railway station and outside work, and have been exclusively adopted in the wiring of the Metropolitan and District stations.

Balcke Cooling Towers.

Messrs. Balcke & Co., of 27, Clement's Lane, E.C., have supplied about 60 cooling towers in this country, both wooden and steel, mostly for electricity works, but in many cases for private use; their work includes both steel and wooden, open, fan draught and chimney coolers. It is noteworthy that no fewer than nine of these towers are for use in connection with gas engines. The firm did not find it convenient to erect a cooling tower 60 or 80 ft. high in the Exhibition Hall, and therefore Messrs. Balcke's exhibit is confined to printed matter and models.

The Morris-Hawkins Electrical Co.

An interesting exhibit is to be seen on the Morris-Hawkins Co.'s stand at the Olympia Exhibition. Two 35-h.p. machines coupled together on a combination bedplate, are running on Hopkinson test, with the idea of demonstrating the heavy overloads that can be carried. The motors have special features, inasmuch as they are fitted with the company's new commutating magnets.

The accompanying illustrations give a clear idea of the general design. The pole core of the commutating magnet is circular in section, thereby economising in copper and in the consumption of energy. In order to take advantage of the circular section, the magnets are mounted outside the main magnets. The design being of simple construction, is cheap to manufacture and especially adapted for the line of standard motors manufactured by the company.

A good commutating magnet fulfils a very necessary want, especially on motors built for 400 to 500-volt circuits, as in such machines the reactance voltage cannot be kept sufficiently low to ensure sparkless collection on the geometrical neutral point.

Four commutating magnets are fitted, each consisting of a pole shoe A, magnet core C, and an exciting coil B, the exciting coil being connected up in series with the armature winding. The magnet core C is fixed to the main yoke F, by studs D. The magnet core C is circular in section, and is mounted outside the symmetry plane of the main magnets E. With the object of reducing the self-induction of the armature coils under commutation, the pole shoes of the main magnets and commutating magnets are connected together by means of copper strips marked H. A test of a 35-B.H.P. motor made by this company and supplied to Messrs. Hulse & Co., of Salford, for driving a planing machine showed excellent results.

The application of the commutating magnet has, of course, a great value for reversible motors and for motors where speed variation is required.

With regard to variable speed motors, the Morris-Hawkins Co. are fitting their patent magnets on all 500-volt machines. The firm have in addition developed a new method of speed regulation which is independent of the weakening of the field by shunt control. The speed variation of this patent motor is effected by altering the

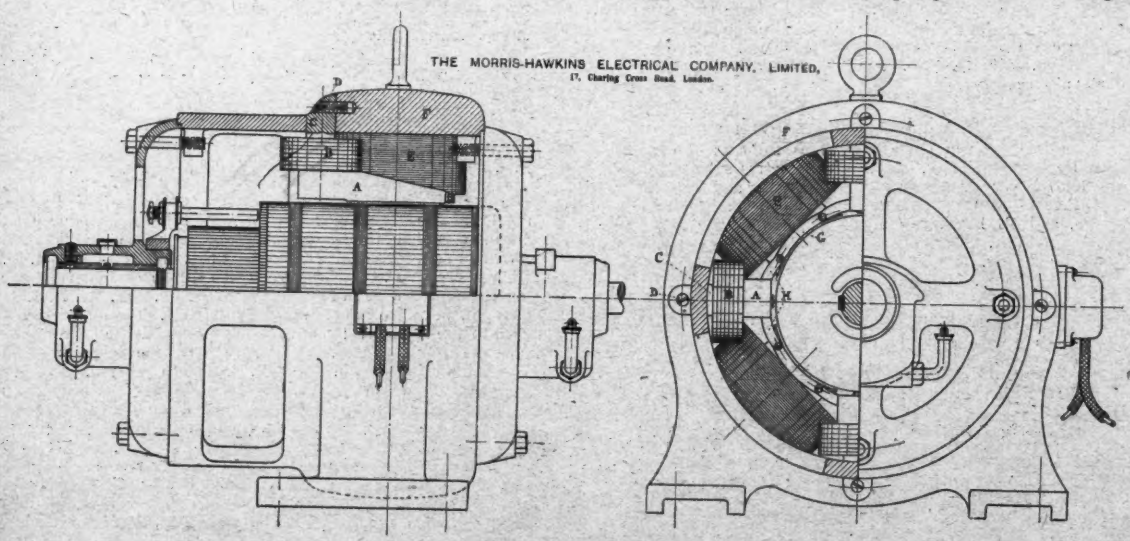


Fig. 29.—Morris-Hawkins Motor, Fitted with Commutating Magnets.

reluctance of the magnetic circuits of the motor. This is accomplished entirely by mechanical means in the most simple and

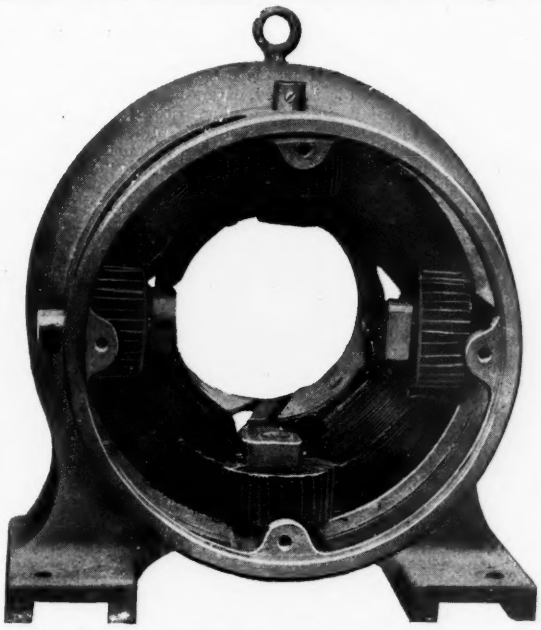


Fig. 30.—View of Field and Commutating Magnets, Morris-Hawkins Motor.

efficient manner, ensuring a thoroughly sound construction. The variable speed motor does not require any separate electrical apparatus for its operation beyond the ordinary starting switch.

The Reason Manufacturing Co., Ltd.

The Reason Co.'s stand contains an exceptionally good display of arc lamps, street-lighting fittings, meters, demand indicators, fuse boxes, service boxes, time switches and other apparatus.

The company's arc lamps include three types—viz., the twin carbon, the series and the miniature. All these lamps possess the great advantage of working without shunt coils, and are shown running on both alternating and continuous current circuits.

Street-lighting fittings in great variety figure on the stand, and include designs suitable for Nernst lamps, now much favoured for street lighting.

A form of meter specially interesting to the small consumer is the slot meter, of which two types are shown—one constructed for shillings and the other for pence. These meters can be adapted to any rate of charge per Board of Trade unit.

is used largely in connection with differential systems of charging, and also for the automatic switching on and off of arc and incandescent street lighting, &c.

For a two-rate system of charging, the controlling clock, which is a self-winding electrical one, is mounted in conjunction with two of the company's standard electrolytic meters. Either one or other of the meters, which, of course, correspond to the two rates of charging, is switched in at the prearranged time by the clock. This combination is very compact and suitable for its special use.

The time switch can also be mounted in conjunction with a circuit breaker, for operating the latter at a prearranged time. In this case the controlling clock closes an auxiliary circuit, energising a solenoid and drawing up a plunger which, in turn, operates the trigger release of the breaker.

The circuit-breaker is a strongly-built switch capable of dealing with heavy currents at 400-500 volts pressure; both it and the time switch are here illustrated.

Underground service and junction boxes, feeder pillars, &c., and an improved type of iron-clad switch are also on view.

Oliver & Co.

The above firm are well known as specialising in arc lighting and street fittings, examples of which they are showing on their stand.

Fig. 31.—The Oriflamme Arc Lamp.

Their principal exhibit is the new Oriflamme arc lamp (see fig. 31) which gives a pleasant, slightly coloured light, and does not require retrimming for from 40 to 50 hours. A new class of

Fig. 32.—Nernst Street Fitting.

Fig. 33.—Series Double-Enclosed Arc Lamp for Burning 100 Hours.

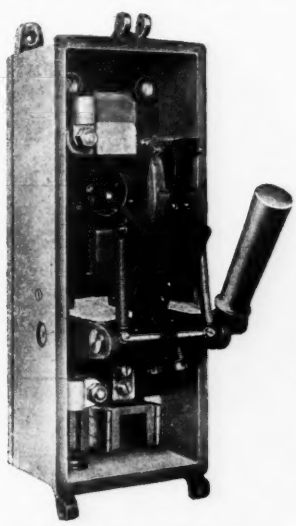


Fig. 34.—Circuit Breaker.

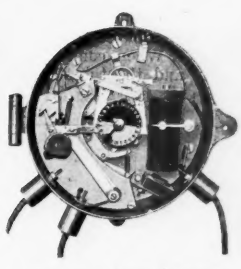


Fig. 35.—Time Switch.

The Reason Co.'s Specialities.

A striking item in this exhibit is the firm's well-known electrolytic meter. This is worked on the principle of the electro-deposition of mercury, and possesses a unique degree of accuracy and sensitiveness. The stability of the material used is now quite assured, and visitors to the Exhibition will find the firm's latest type of meter well worth inspection.

The company's well-known demand indicators, of both the thermal and the magnetic types, and fuse boxes of many patterns are on view.

A speciality of more than ordinary interest is the time switch, which the company is now making for various purposes. This carbon is used, which is much cheaper than that ordinarily adopted in flame arc lamps, and this brings the carbon cost into line with that of the ordinary open-type arc lamp.

The new lamp has only recently been placed on the market, but the firm has already secured contracts for street lighting with it at Woolwich and Wishaw.

Hunt & Hess.

Messrs. Hunt & Hess, of Litholite Works, Hackney, make a speciality of their moulded insulators; the XX grade in particular is recommended for dynamo insulation, as, unlike mica, it does not chip or scale.

F

The Langdon-Davies Motor Co., Ltd.

The Langdon-Davies Motor Co., Ltd., exhibit sundry of their well-known alternating current motors in operation, fitted with a new type of rotor which, it is claimed, gives a much improved efficiency and power factor, direct current motors, a petrol-electric generating set, and last, but not least, in point of interest, the original experimental model of the first Langdon-Davies

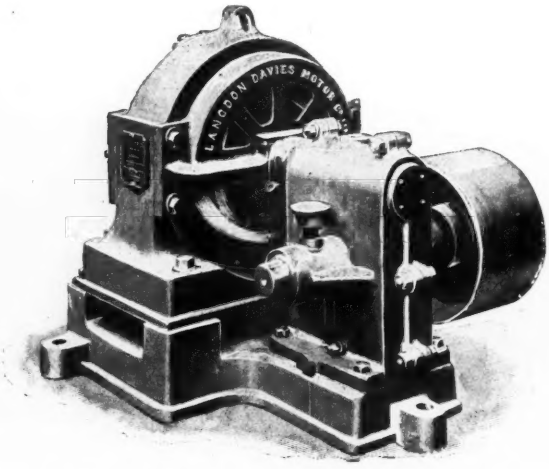


Fig. 36.—Langdon-Davies Motor and Worm Reduction Gear.

motor. Amongst the above, our attention was drawn to a 25-B.H.P. single-phase A.C. motor direct coupled to a D.C. generator; an organ blower, driven by an A.C. motor and equipped with a new pattern of automatic starter; examples of cigarette and box-making machines, driven by the firm's motors through various reduction gears.

The petrol-electric lighting set is a serviceable combination for private house lighting, its small bulk and economical working specially fitting it for this class of work. Our illustration is of one of the firm's motors fitted with their new worm reduction gear.

Simmonds Brothers, Ltd.

The attraction of Messrs. Simmonds's stand is the firm's improved plug couplings for flexible cables, for which patents are pending.

The essential feature of the system is the employment of lengths

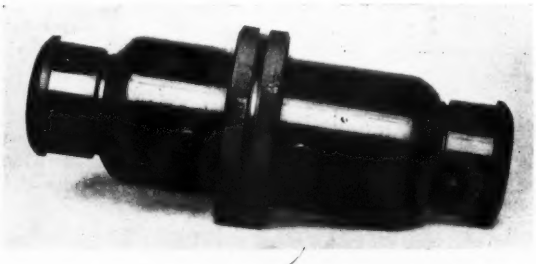


Fig. 37.—Improved Plug Coupling, Fitted Up.

of flexible steel tubes wired with flexible twin cables and joined by means of double-pole plug couplings of a very simple and neat design. When connected up the whole system is perfectly water-tight, and the tubes being in metallic connection with earth

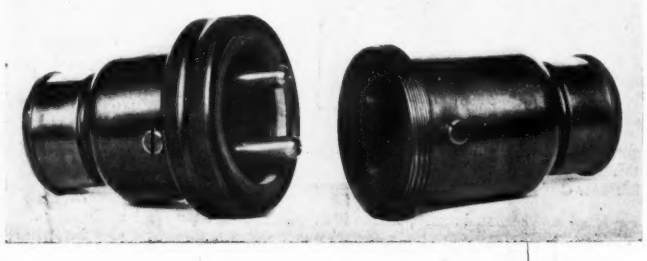


Fig. 38.—Improved Plug Coupling, Taken Apart.

throughout, all danger of shock or fusing in the event of a leak is obviated.

The couplings are small for their carrying capacity, a 50-ampere coupling only measuring 5½ in. in length × 2¼ in. external diameter. Sub-circuits can be tapped off at any point by means of teeing couplings.

These couplings will be of special use in heavy temporary installations, such as are used by builders, shipbuilders, collieries, engineering works, &c.

Our illustrations, figs. 37, 38 and 39, almost self-explanatory, but we may point out that in the base of each hole in the female section of the plug a small pin is fitted, which, when the split plug of the male section is inserted, enters and expands the latter; the arrangement being, in fact, a plug within a plug. When tightened up, these plugs are practically solid, and the socket arrangement is sufficiently simple and "fool proof" to tax the power of the most accomplished "British workman" in making a mistake.

Visitors to the stall can see this system adapted to its lighting.

James Keith & Blackman Co., Ltd.

The Blackman electric fans are too familiar to need description; a number of them are shown, ranging in diameter from 12 in. to 48 in. One of the novel features of the exhibit is a 12-in. fan combined with a motor, which has been specially constructed for use in connection with small refrigerating plants. Another is the forge hearth and Keith-Blackman electric blower, which we illustrate herewith; this is a capital arrangement, each forge in a smith's shop being thus made independent of the rest. Instead of keeping a large blower running to blow all the fires, when, perhaps, only one or two are in use, with consequent waste of power, only

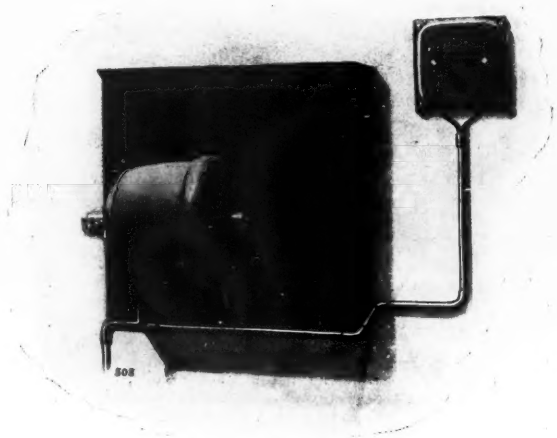


Fig. 40.—Keith-Blackman Forge Blower.

those blowers which are actually required need be run, and the blast in each case can be regulated independently to the desired strength. The blower can be had separately, but our figure shows it complete with water tank, tuyere and rheostat. Larger high-pressure blowers are also made.

A very elegant little apparatus is the electric table humidifier, which consists of a fan and a dispersing device, by means of which moistened air, impregnated with perfume, disinfectants, &c., is equably diffused throughout a room. This is intended for use in hospitals, sanatoria, &c., but its uses are obviously by no means confined to medicinal purposes.

Diesel Engine Co., Ltd.

An interesting exhibit is to be found at Stand No. 208, where the Diesel Engine Co. show at work a 20-H.P. Diesel engine, direct coupled to a dynamo. This is the first occasion on which such a plant has been exhibited in this country, although at the Liége Exhibition a 500-H.P. engine is shown at work.

Some 2,000 of these engines are now running in different parts of the world, with a total of nearly 100,000 H.P.

Fig. 39.—Tee Coupling.

Though the engine shown at Olympia is quite a small one, they are being built in all sizes up to 800 H.P., and engineers requiring day-load or emergency plant would do well to inquire into the merits of the engine for their purpose.

A. Reyrolle & Co., Ltd.

Messrs. Reyrolle's stand emphasises their activity in switch work, of which numerous examples are on view. One of the new accessories exhibited by them, which we illustrate, is their Compact" motor switchgear panel. This consists of a quick-break double-pole switch, two single-pole ironclad fuses, and a protected starting rheostat with overload and no-voltage release, neatly

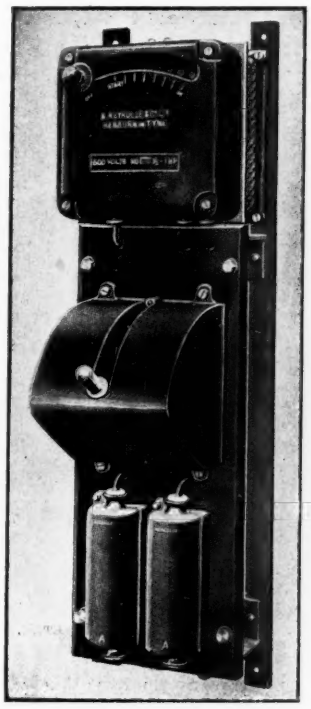


Fig. 41.—The "Compact" Motor Switchgear Panel.

assembled upon a well-finished slate base ; all the connections are provided between the separate parts, each of which is mounted in such a way that it forms a separate and accessible apparatus. The panel is ready for mounting on a wall or elsewhere as requirements may suggest. The motor starter is of the lever type, and is fitted with the firm's special resistance.

There are many useful features about this starter, among which is to be counted the fact that the resistance acts as an automatic electricity valve, allowing the starting current gradually to rise until the motor starts; the motor will start at all loads while the

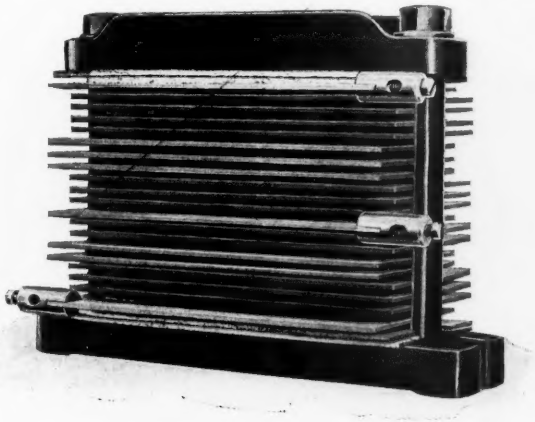


Fig. 42.—Resistance for "Compact" Panel.

handle is held upon the first stud. The resistance is of fireproof material and cannot be burned. It will, therefore, stand large overloads, and can be worked until it is red hot without running serious risks. It consists of a number of flat iron plates and a special material carried in an asbestos frame, sandwiched in between.

It may be of interest to know that the "Compact" motor switchgear panel has been specially designed to meet the extensive requirements of the Newcastle-upon-Tyne Electric Supply Co., Ltd., for motors up to about 10 h.p. ; for larger sizes the standard drum type of starter, which is also on view, is used.

The Lancashire Dynamo and Motor Co., Ltd.

Trafford Park is the home of many industries, though none are so well known in that neighbourhood as the electrical ones, and of the latter, by reason of its excellent work, the above firm claims distinctive reference for its exhibits. Among them is an automatic reversible booster of the Turnbull & McLeod patent type, as shown at the Tramways Exhibition, and described in the Electrical Review of October 28th, 1904.

The motor for this is wound for 500 to 550 volts, and the booster is capable of developing 200 amperes at 0 to 120 volts continuously, 300 amperes for one hour and 400 amperes for five minutes at 0 to 60 volts. This booster has many advantages which have received due recognition from the engineer.

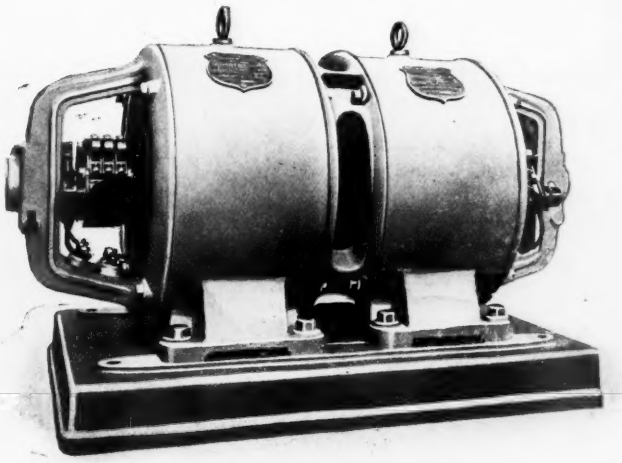


Fig. 43.—L. D. & M. Co.'s Special Balancer.

Various standard induction and d.c. motors are also on view, and a balancer set, which we illustrate. The latter combination consists of two standard machines coupled back to back, and having two bearings only. The construction of this, as of the firm's other machinery, is both mechanically and electrically sound, and will repay close scrutiny.

Fricker & Miller.

One of the most interesting exhibits to the supply engineer and, of course, indirectly to the consumer, is that of Messrs.

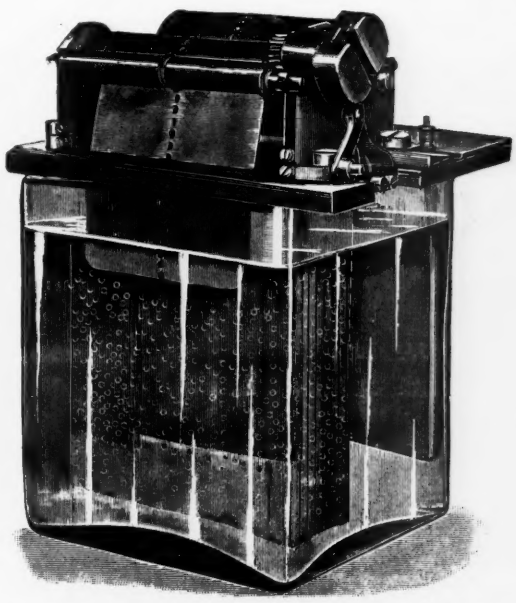


Fig. 44.—Depositing Cell and Strip Carrier of Mordey-Fricker Prepayment Meter.

Fricker & Miller. This firm is showing a variety of its well-known electricity meters, prepayment and otherwise, and among the latter, for the first time, the Mordey-Fricker electrolytic prepayment meter.

In all prepayment meters hitherto introduced, a more or less complicated switching mechanism has been necessarily added to the ordinary meter mechanism, involving extra wear and tear, and

increased first cost. In this electrolytic prepayment meter, beyond the manual operation of prepaying coins into the till as required, there are no mechanical movements whatever, and at the same time the cut-off after the prepaid energy has been consumed is infallible. The extreme simplicity of the meter permits the low first cost and small subsequent up-keep charges, which are essential to the success of any large prepayment meter scheme of supply.

The illustration given is almost self-explanatory. As will be seen, the meter consists of a depositing cell wherein the cathode is fixed and partitioned off from the anode by a perforated celluloid diaphragm. The anode is in the form of a roll of thin copper strip, carried on the upper part of the plate covering the cell. A definite length of this strip, which is rolled to a uniform thickness, is fed into the electrolyte over a sprocket roller, through a slot in the

Fig. 45.—Mordey-Fricker Electrolytic Prepayment Meter.

cover plate, by the operation of each coin. When the portion thus immersed has all been dissolved by electrolysis and a like quantity deposited on the cathode, the circuit is automatically broken at the surface of the electrolyte.

In the 1d. meters, a maximum feed corresponding to eight coins

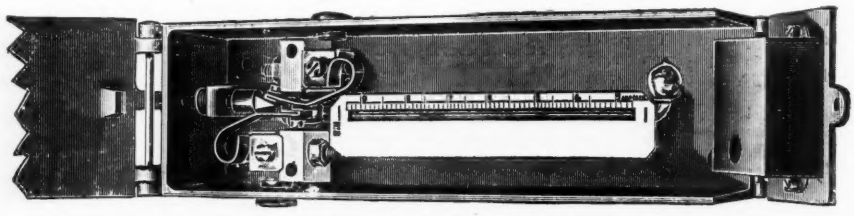


Fig. 46.—The Fricker Demand Indicator.

may be immersed. The average pressure drop depends upon the length of anode immersed, and with one coin's worth only, it does not exceed 1·3 volts per ampere passed.

The anode rolls are made to serve 600 coins, and, together with the cathode plates, are readily renewed. The difference between the value of the copper in the rolled anode form and as deposited on the cathode, is about 1 per cent. of the revenue from the meter. The firm undertakes to purchase the deposited copper at market prices.

The electrolyte consists of copper nitrate, and is unaltered by the action of the current, merely serving as a carrier of copper from anode to cathode. Copper nitrate being a deliquescent salt, there is no evaporation of water and consequently no "creeping" of the salt itself. The solution requires filtering from the "sludge" of fine copper sheddings at long intervals; probably once in two years would be sufficient.

A counter records continuously the number of coins paid in, this record multiplied by a constant giving the units consumed. The amount of prepaid energy available at any time may be approximately estimated by the appearance of the immersed anode copper as seen through the window in front of the meter case. The simplicity of this meter is its great attraction, and judging from the interest taken in it, we imagine it will find a ready application.

Among other interesting and novel items, which are equally worthy of inspection, are Fricker's remote control switch, Fricker's thermal volt and ampere meters, and the Fricker patent maximum demand indicator; the latter is, however, well known, and from the consumer's point of view has this good feature, that if the mercury is visible anywhere in the stem of the tube while the meter is working, it is known that the instrument is working below the previous maximum.

Everett, Edgcumbe & Co., Ltd.

Perhaps the most interesting feature of this stand is the complete set of lamp-testing apparatus which is on view. At this time of year, probably, the first consideration in everyone's mind is the question of lamps—what to get and where to get them—so that

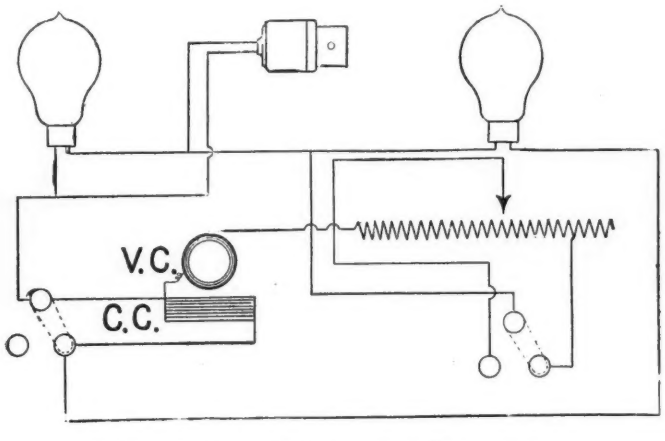


Fig. 47.—Diagram of Portable Watt-Photometer.

any help towards solving this difficult problem should be welcomed on all hands.

There are also to be found instruments to meet all requirements and all purses, from the more humble lamp-testing ammeter (which, it should be remarked, is not to be confounded with the almost valueless watch pattern instrument sometimes met with, but which has a thoroughly open scale of good length) to the most ingenious watt-photometer, by means of which the watt consumption of a lamp can be read off without any calculation.

The portable glow lamp photometer has been gradually evolved from the somewhat crude grease spot and card arrangement of three years ago, until the present extremely compact and practical little apparatus has been produced.

Central station engineers, who are now nearly all considering what steps should be taken to induce customers not only to burn good lamps, but also to renew them so soon as they become inefficient, will find in the portable watt-photometer a friend in need.

The photometer proper consists, as will be gathered from the

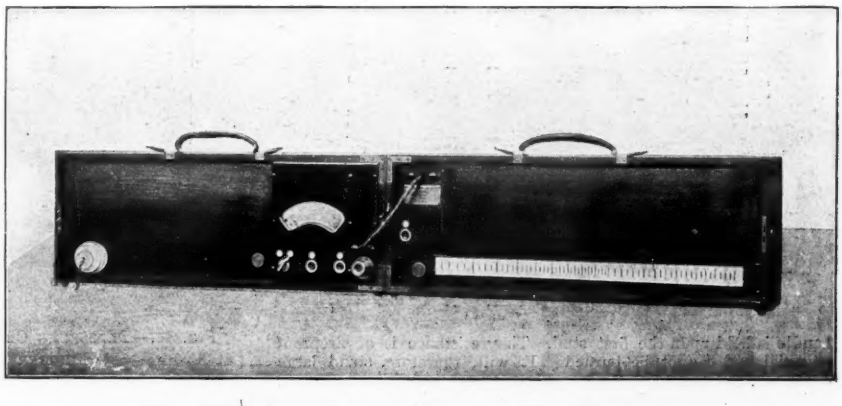


Fig. 48.—Everett, Edgcumbe's Portable Watt-Photometer.

illustration, of a polished mahogany case, hinged in the centre.

A carefully calibrated incandescent lamp forms the standard, and the candle-power of the lamp under test is read off on a direct-reading scale, the accuracy being, moreover, independent of fluctuations the voltage. The lamps are completely enclosed, so that

the apparatus can be used in broad daylight without any inaccuracy being introduced.

A direct-reading two-range wattmeter is fitted into the same case, and is provided with an additional key, on depressing which the pointer indicates the efficiency of the lamp direct in watts per candle-power.

The internal connections are shown in fig. 47, where v.c. is the volt coil, and c.c. the current coil, from which it will be seen that as the right hand lamp-holder travels towards the photometer, it passes over a number of contacts whereby the resistance of the pressure circuit of the wattmeter is decreased and *vice versâ*. The value of these resistances is such that the scale can be graduated direct in watts per candle-power. When it is desired to read watts only, this variable resistance is replaced by a fixed resistance. The candle-power, watt consumption and efficiency of the lamp are thus read off direct, and without any calculation. Connection can immediately be made to any electric light fitting by means of an adapter which is attached to the instrument.

The whole apparatus when closed is thoroughly portable, and has been especially designed for the use of central station engineers, who can send it to consumers' premises and demonstrate to them on the spot, that it is generally their lamps that are actually at fault and not the supply voltage, which usually comes in for condemnation when the light becomes dim, or the quarter's bill comes to more than was anticipated.

When arc or Nernst lamps are to be tested, as well as glow lamps, the "Flicker" pattern photometer is recommended, owing to the fact that colour variations do not vitiate the results. For arc lamp testing a simple mirror attachment is provided, by means of which measurements of candle-power can be made at any desired angle.

A new street lighting photometer shown is a modification of one designed by Mr. Haydn T. Harrison, whose long experience in street lamp testing is well known.

Amongst other instruments of considerable interest should be noticed the "Inkless Recorder," recently described in the Electrical Review, and leakage indicators for coal mines, &c.

J. Halden & Co.

Time was when the engineer depended on a somewhat uncertain daylight for his photo-printing operations, and frequently as a last resort, returned to the ink and tracing paper of his youth. Modern engineering photography, as exemplified by Messrs. J. Halden & Co.'s continuous (electrical) copying machines is, however, a very different matter, and at the present day these appliances are, in an office of any magnitude, practically a necessity.

At the Exhibition this firm is showing examples of an electric semi-tilting frame, an electric duplex frame and an electric double continuous frame; the latter, which is one of the latest developments in this line, is illustrated in fig. 49.

The machine is made both in single and double form. The latter promises to be the most valuable and economical, as the one set of arc lamps is arranged in a simple manner to cause the light to work on two tracings and prints as they pass on before it.

The operation of the machine is very simple, and can be entrusted to any intelligent junior. The operator winds on to a loose spindle the tracing, which may be 50 or 100 yards long, or a continuation of tracings lightly joined to each other; the spindle thus filled is then replaced in its forks. The spindle to carry the sensitised paper is run through the roll, and in its turn placed in its forks on the table of the machine. The operator now draws the end of the tracing on to the end of the photo paper, guiding the two combined to the contact rollers, when he starts the motor which propels the machine. The two substances are carefully fed on to the upper contact roller, which draws in equally and correctly.

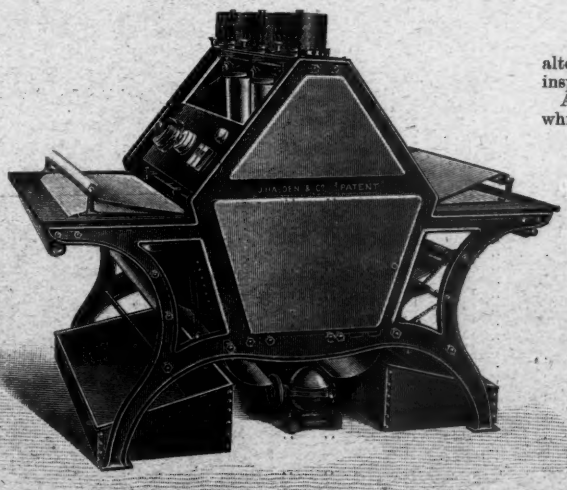


Fig. 49.—Double Continuous Copying Frame.

The arc lamps are switched on at this point. The tracing, with the photo paper behind, may now be discerned passing almost imperceptibly between the flat glass plate and the contact rollers, the latter being so constructed as to give an unvarying pressure at all times.

The speed at which rapid ferro paper receives the correct exposure is 1 ft. lineal of paper per minute, regardless of width.

As the tracing and exposed photo paper come free from the contact plate and rollers, they are guided to separate rollers, which wind up automatically, until the whole length placed on the feeding spindles has passed the contact plate, when the arc lamp and motor are both switched off, the photo print carried away for development, and the tracing removed from the other spindle.

A continuous electric washing and drying machine is also shown.

This apparatus is all manufactured at the Cornbrook Works, Manchester.

W. H. Allen, Son & Co, Ltd.

Messrs. W. H. Allen, Son & Co. show examples of their high-speed vertical enclosed engines, condensing plant and "Conqueror" pumps, which are so well standardised and so familiar to our readers that there is no necessity to describe them in detail. These are all manufactured on the limit-gauge system, with absolute interchangeability—a special feature on which the firm pride themselves.

A noteworthy exhibit is a three-throw crankshaft, which has been at work in a 500-h.p. engine for seven years, 12 hours a day, at 300 r.p.m. Nevertheless, the wear is practically insensible; where it is measurable, it amounts to only a microscopic value—in no case exceeding ·0028 in. in a diameter of 6 in., or ·015 in. in a diameter about twice as great (the eccentric sheaves). All the journals are perfectly cylindrical. Such an excellent result testifies not only to the original accuracy of the work, but also to the quality of the forced lubrication and to good material and workmanship throughout.

Davies Patent Boiler, Ltd.

Unfortunately, the Davies boiler, which was to have been shown, was not ready in time for exhibition. It consists of a series of elements of tubes built up in pairs of semi-cylindrical top and bottom half drums, united by a number of 2-in. tubes. The bottom drums form the roof of the furnace.

A specimen ring of the Premier boiler tube is shown; solid-drawn steel tubes, 2 to 3 in. in diameter, are arranged vertically in the flues. About 384 such tubes are inserted in nests in a Lancashire boiler 8 ft. × 30 ft., with flues 3 ft. in diameter.

The Crypto Electrical Co.

The Crypto Co. is especially well known in connection with the ever-popular miniature dynamo and motor, and its exhibit of small alternators, some of which are new to the public, should be carefully inspected.

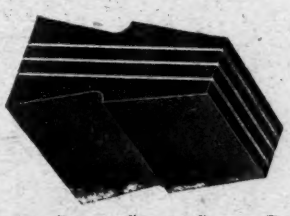


Fig. 50.—Crypto Carbon-Copper Brush.

Among the features of the stand is a new carbon-copper brush, in which will be seen embedded in the carbon, three parallel copper strips. These brushes are expected to successfully meet any conditions of commutation.

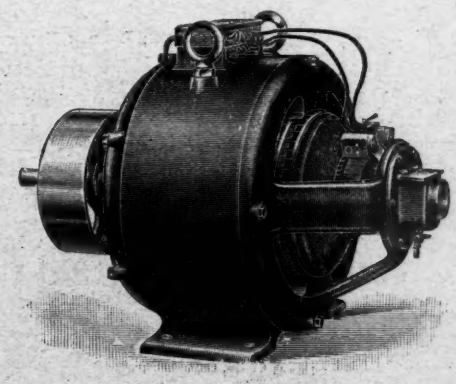


Fig. 51.—Crypto Motor.

E. Green & Son, Ltd.

The Green specialities in the way of economisers, air heaters, pumps, &c., form the main features of this firm's exhibits; their universal use absolves us from further description here.

The British Electric Plant Co., Ltd.

The most prominent exhibit of this firm is a duplex double-acting variable-stroke boiler feed-pump (Spence's patent) driven by constant-speed motor, the capacity being 3,000 gallons per hour against a boiler pressure of 200 lb. per sq. in. The variation of stroke is obtained by means of an extremely simple worm and wheel gear with star wheel and tappet from 0 to 5 in., step by step at each revolution of the crankshaft, and, of course, the delivery is correspondingly varied. A special feature of the design is the care taken absolutely to prevent the slightest trace of air lock, and this feature, together with adequate air vessels on both suction and delivery sides, has made it possible to obtain a delivery substantially as uniform as that from a three-throw pump. The pump is driven through single reduction gear, raw-hide pinion and machine-cut cast-iron internal wheel, by a B.E.P. 12-B.H.P. shunt-wound motor.

Among the several motors on view, we noticed one of the firm's compensated type, providing for extremely wide speed range through pure shunt control. This will develop 8½ B.H.P. at a slowest speed of 645 r.p.m., and the same on slightly more power at all speeds up to 2,000 r.p.m. The range in this case is not very great, because the top speed is limited by mechanical considerations, not at all by electrical ones. Motors with speed ranges of 4 to 1 or 5 to 1 must necessarily have extremely low slowest speeds, otherwise the highest speeds will, of course, get excessive. Each of the motors has starting gear or starting and regulating gear in a cast-iron case with glazed front.

The London Electrical Fittings Co., Ltd., and the Wandsworth Electrical Manufacturing Co., Ltd.

These firms jointly occupy a stand in proximity to the main entrance, where visitors with an eye to the beautiful may easily pass more time than they imagine. The designs are in Dutch, Elizabethan,

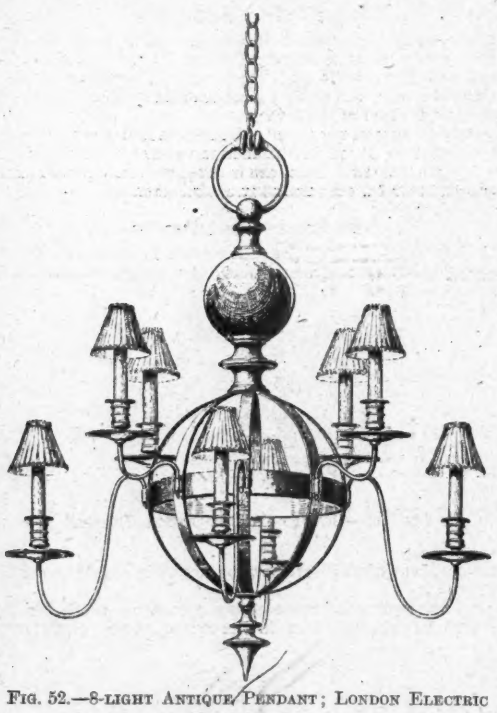


Fig. 52.—8-light Antique Pendant; London Electric Fittings Co.

Georgian and Adam styles, too numerous to mention; the workmanship is excellent. Accessories, switches, switch and fuseboards complete an excellent exhibit.

The Morgan Crucible Co., Ltd.

The Morgan Crucible Co., Ltd., of Battersea Works, S.W., have a lengthy series of "Morganite" specialities on view, publicly for the first time. Among these may be noted the patent Morganite brushes, a special feature of which is the flexible connection embedded therein; these can be seen running on machines hard by. The Morganite dash-pot plungers and self-lubricating bearings are also worth inspection.

Regina Arc Lamps.

Mr. Rudolph Grunhut, of 34, Gracechurch Street, E.C., exhibits a number of different patterns of the "Regina" arc lamp. It is claimed for this lamp that it burns for about 350 hours, without accumulating dirt in the inner globe—a marvellously long period. The lamp is suitable for either D.C. or A.C., and takes from 1 to 8 amperes. Regina No. 8B is a special design for interiors, the arc being inverted, and the light being thrown down from a large reflector. No. 10 is the Regina copying lamp, which burns with a very long arc, and gives a light especially suitable for photographic printing. The Reginula is a neat little lamp, taking from 1 to 2 amperes, and burning 30 or 40 hours with 5-mm. carbons; it is adapted for indoor and outdoor use, inverted or direct.

The Key Engineering Co., Ltd.

This company gives prominence to two specialities—viz., fibre conduit and the Carbone arc lamp. The virtues of the former are its watertightness, and that it is unaffected by high temperatures, acids or alkalies; it is non-inflammable when laid, is a perfect insulator, and entirely prevents electrolysis. We gather that it has already met with success in the lighting and tramway field.

The Carbone arc lamp is of the white flame type, an effect obtained by the use of pure carbons. The latter are inclined towards each other as with the ordinary chemical carbon lamps, and as the positive crater is quite unmasked by the negative carbon and its holder, there is no shadow. Its novel features are well worth inspection.

The High-Speed Braiding Machine Co., Ltd.

Our brief inspection of the exceedingly ingenious machinery on this firm's stand justifies us in calling the attention of cable and braid makers to its merits. The operation of the machine is based on a well-known geometrical principle, but an adequate idea of its working can only be obtained from close inspection.

The improvements embodied in the machine tend in the direction of greater efficiency, simpler manipulation, less wear and tear, and greater carrying capacity. The machines shown are capable of braiding up to 2½ in. diameter cable, with jute, cotton, &c.; the offices of the firm are at 7, Norfolk Street, Manchester.

Chameleon Signs, Ltd.

The Chameleon Signs, Ltd., of 318, Dashwood House, E.C. display on a pretty Japanese stall, specimens of their very ingenious, and attractive signs. The colour changing effects defy ordinary description; but, for the benefit of the curious, we may say that the illuminating lamp is surrounded by a many-coloured transparent cylinder, which is rotated through its attachment to a small fan suspended just above and in the path of the heated and therefore rising air, the action being automatic throughout.

St. Pancras Borough Council.

This enterprising municipality has taken advantage of the opportunity to demonstrate the domestic uses of electricity; the stand is lighted with four flame arcs, and electric lighting and power, heating, cooking and ventilation are all represented in material form. A pamphlet is issued by the department, compiled by Mr. Albert Blanks, the publicity officer of the Council, in which the tariffs for lighting, power, &c., are set forth, with practical examples intended to bring home to the user some idea as to "how far a unit of electricity will go." Testimonials from consumers appear enthusiastically declaring electric light and power to be far cheaper than gas and steam, and superior in cleanliness, adaptability and other respects to either of these rival agents. The pamphlet is decidedly convincing, and ought to exert a marked influence upon the development of electricity supply.

(To be continued.)

FORTHCOMING VISITS TO OLYMPIA EXHIBITION.

The following is a list of visits (as mentioned in our leader pages to-day) which have been arranged by borough electrical engineers and their committees:—

Probable date of visit.	Coming from.	Names of deputation.
Oct. 5 or 6	Walsall	A. Wyllie (Eng.) and Chairman.
,, 6 or 7	Harrogate ..	G. Wilkinson (Eng.) and Chairman.
,, 6	Birkenhead ..	W. Bates (Eng.) and Committee.
,, 6	Paisley	C. F. Parkinson (Eng.).
,, 6	Barnes	Deputation.
,, 6	Halifax	W. M. Rogerson (Eng.).
,, 7	Sheffield	Mr. J. W. Beauchamp (Deputy Manager).
,, 7 to 9	St. Helen's ..	E. M. Hollingsworth (Eng.) and Chairman.
,, 9	Barrow-in-Furness	H. R. Burnett (Eng.) and Chairman.
,, 9	Ilford	A. H. Shaw (Eng.), Clerk and Committee.
,, 9	Malvern	W. J. R. Baker (Eng.) and Deputation.
,, 10	Sleaford	R. Spencer Yates (Eng.).
,, 10	Bray	W. J. U. Sowter (Eng.).
,, 10	Worksop	J. P. Crowther (Eng.).
,, 10	Burnley	J. E. Starkie (Eng.).
,, 10 to 12	Mansfield	E. H. Hewlett (Eng.) and Chairman.
,, 10	Weymouth ..	R. G. Simpson (Eng.).
,, 10	Sheffield	Six Members of Staff (Mr. Fedden coming later).
,, 10	Loughborough ..	W. H. Allen (Eng.).
,, 10	Kettering	Deputation from Lighting Committee.
,, 10	Salford	C. D. Taite (Eng.) and Committee.
,, 10 (And every Tues. & Th. afternoon.)	Ealing	J. D. Knight (Eng.).
Oct. 10 & 11	Aberdeen	J. A. Bell (Eng.) and Chairman.
,, 11	Eastbourne ..	J. K. Brydges (Eng.).
,, 11	Tonbridge ..	J. A. B. Horsley (Eng.) and Deputation.
,, 11	Rochdale	C. C. Atchison (Eng.) and Chairman.
,, 11 or 12	Lancaster	W. A. Tester (Eng.).
,, 12 & 13	Manchester ..	S. L. Pearce (Eng.) and Committee.
,, 13	Long Eaton ..	F. Worrall (Eng.).
,, 13	Blackburn ..	P. P. Wheelwright (Eng.).
,, 13 or 14	Chester	S. E. Britton (Eng.) and Deputation.
,, 13 or 14	Gloucester ..	W. J. Bache (Eng.).
,, 15 or 16	Greenock	J. A. Robertson (Eng.) and Deputation.
,, 15 or 16	Perth	J. Lambert (Eng.).
,, 17 or 18	Partick	H. B. Maxwell (Eng.) and Chairman.
,, 16 to 18	Sunderland ..	J. F. C. Snell (Eng.) and Deputation.
,, 17 or 18	Shipley	S. D. Schofield (Eng.) and Deputation.
,, 18	Worthing	G. Porter (Eng.).

On Wednesday next, 11th inst., the Dynamicables will dine amicably together at the Electrical Exhibition at Olympia at 7 p.m., so it may be expected that on the afternoon and evening of that day there will be about the Hall many leaders in the electrical profession. By the way, we learn that the limit of membership in the Dynamicables was reached at the election of members in May last.

NOTES.

Railway Servants and Electric Traction.—Mr. R. Bell, M.P., the general secretary of the Amalgamated Society of Railway Servants, in his annual report, referred to the progress of electric and pneumatic signalling, and called attention to the displacement of labour, which was a feature of the change. In two cases which he mentioned the wages of the signalmen retained had not been increased, although it was obvious that, in spite of a diminution in manual labour, their responsibilities had been greatly added to. He had a similar complaint to make with regard to the electrification of railways. The Metropolitan and Metropolitan District Railways had been gradually increasing their electric service, and it was expected that steam traction on those lines would soon be a thing of the past. By these changes the public gained by having a better service, more comfortable carriages, and an atmosphere less redolent of sulphur; the companies gained, or hoped to gain, by reducing the cost of working and increasing the number of passengers carried, but the unfortunate railway servants lost owing to the rates of pay being reduced in many instances. This was not as it should be. When everybody else benefited, surely the men who did the work should receive some consideration!

At the annual meeting of the Railway Men's Union at Sheffield, on Monday, the president referred to the effects of electric traction on the position of the workers. He (Mr. Councillor J. H. Thomas, of Swindon) said that there could be no doubt, judging from the present tendency, that the motive power of the future would be electricity. Notwithstanding the efforts of the organisation, and the many and various representations to the Board of Trade by their general secretary, approval had been given by that body to the running of passenger trains with one man in the cab. This, again, not only reduced the number of men employed, but completely changed the whole system. Experience as cleaners and firemen, which was considered imperative before, was not now considered necessary, the policy in some cases being to draw men from almost any grade with a view to training them for motormen. There was abundant evidence of the seriousness of the position. Did the enginemen and firemen realise the danger? The remedy, in his opinion, was "one society for all railway men."

Institution Notes. — Institution of Electrical Engineers (Glasgow Section).—The fourth annual dinner is to be held in the New Banqueting Hall of the Grosvenor Restaurant, Gordon Street, Glasgow, on Friday, October 27th. The opening meeting is to be held on Tuesday, November 14th, at 8 p.m., when Mr. John M. M. Munro will deliver his inaugural address. The meetings for the session will be held, as in previous years, in the large hall of the Institution of Engineers and Shipbuilders.

Institution of Civil Engineers.—The Council of the Institution of Civil Engineers have, in addition to the medals and prizes given for communications discussed at the meetings of the Institution in the last session, made the following awards in respect of other papers dealt with in 1904-5:—A George Stephenson Medal to Capt. H. R. Sankey, R.E. (retired), London. A Watt Medal to Dr. C. Chree, F.R.S., Richmond. Telford Premiums to Messrs. W. E. W. Millington, Oldham; C. E. Stromeyer, Manchester; C. W. Hill, London; F. C. Lea, London; W. B. Cole, London; W. C. Popplewell, M.Sc., Stockport; E. H. Rigby, B.Sc., Tientsin; and W. O. Leitch, jun., Tientsin. For Students' papers the awards are:—Miller prizes to Messrs. A. B. Potts, Macclesfield; W. M. Hayman, Glasgow; R. E. Bury, Calcutta; T. Lees, jun., Winnipeg; T. L. Matthews, London; P. J. Risdon, London; F. E. Tudor, Stevenage.

Civil and Mechanical Engineers' Society.—It was announced that last evening, at Caxton Hall, Mr. W. B. Esson would deliver his presidential address.

Electro-Harmonic Society.—The 1905-1906 season (the twentieth) of this well-patronised and progressive Society is to be opened by a Smoking Concert on Friday evening, October 20th, at 8 p.m. The King's Hall, Holborn Restaurant, will, as before, be the place of meeting. The dates of the events of the season are as follow:—

Friday, October 20th	... ...	Smoking concert.
,, November 17th	... ...	Ladies' night.
,, December 15th	... ...	Smoking concert.
,, January 26th	... ...	,,
,, February 23rd	... ...	Ladies' night.
,, March 30th	... ...	Smoking concert.

Olympian Lectures.—On Friday last Mr. W. Duddell, M.I.E.E., lectured at the Exhibition on wireless telegraphy. Beginning with a reference to the antiquity of wireless telegraphy, and the different systems and apparatus employed, Mr. Duddell related how, in 1896, Mr. Marconi came to this country with an apparatus for signalling over considerable distances, and how successful installations were erected by Sir William Preece, late engineer to the Post Office. He then described the different apparatus and demonstrated the uses of the different parts by means of models, lantern slides and experiments. Among his models was an original oscillator used in the early days, eight or nine years ago, in our Post Office. The lecturer concluded by describing some of the tests carried out by Mr. J. E. Taylor and himself, under the superintendence of Mr. Gavey, engineer-in-chief to the Post Office, between the shore and the cable ship *Monarch*, during which actual measurements were made. These tests established the relations existing between the strength of the received signal and distance, and the height of the vertical wire and its resistance.

Lecturing last Tuesday evening, Col. R. E. Crompton, C.B., R.E., made a strong plea in favour of the more general use of electricity as a motive power, both commercially and domestically, particularly in the latter direction. In the course of his lecture, setting forth the development of the use of electric motors, Col. Crompton referred but briefly to the historical side, but pointed out that within the last few years the price of motors had been halved, and, owing to the large amount of care and thought spent upon it, the domestic motor was now even more simple than the domestic sewing machine. He was strongly in favour of the two-rate meter as the best method of cheapening the supply, the power during daylight being provided at a cheaper rate, so as to encourage a more extensive use of electrical power during the time when it is not required for lighting purposes. Col. Crompton also referred to the great advantages accruing from the use of electricity domestically, and saw no reason why motors should not be used to work dish and bottle-washing machinery, plate-cleaning, coffee roasting, meat and sausage chopping, dough kneading and domestic laundry appliances, to say nothing of the artistic and decorative pursuits such as metal-working, engraving, cutting and polishing, jewellery cleaning, pressing and embossing metals and leather, book-binding, cabinet-making, &c., whilst everyone by using motors to compress air would be able to have his cold storage rooms in his own house.

Appointments Vacant.—Engineer-in-charge for Wimbledon Electricity Department (£91); junior assistant for Aldershot (£65); foreman for telephone construction work for Ceylon Government (Rs. 2,400 per annum and rent allowance); supervisor for the Royal Ordnance Factories, Woolwich (£150 to £220); assistant engineer for Maidenhead Electricity Works (£104); electrical engineer for West Ham Council (£350, rising to £500); chief lecturer in electrical engineering department at Salford Royal Technical Institute (£250).

Electrically Welded Cap Screws.—The Franklin Institute has awarded the John Scott Legacy Premium and Medal to D. J. Kurtz, the originator of a method of making bolts used by the Cleveland Cap Screw Co., of Cleveland, U.S.A. In this process the heads and bodies of the screws are made separately from die-drawn stock, and are welded together with the Thomson electric welder. The screw bolts made in this way are actually stronger than those milled down from the solid, or with upset heads. Brass heads can be welded to steel bodies, and cap screws made in this way are used in large quantities for switchboard and similar work.

Niagara Falls.—On Tuesday Prof. W. C. Unwin delivered an inaugural address to open the 1905-6 session at the Central Technical College in Exhibition Road. He took "Niagara Power Stations" as his subject.

Fire at a Berlin Cable Factory.—A serious fire took place on September 26th in one of the departments of the electrical works at Upper Schonweide, Berlin, where work had already been suspended owing to the strike or lock-out of 6,000 workers. The watchman who went his rounds between 5 a.m. and 6 a.m. did not observe anything unusual, nor did the works' fire brigade, which is formed of employés who remained at their posts after the withdrawal of the workmen in a body. Shortly after 6 a.m., however, smoke was observed to arise from a warehouse used as a store for the cable factory, and an alarm was at once given. Owing to the strike the machinery was at a standstill, and it was, therefore, impossible to blow the steam whistle, the result being delay in the attendance of the local fire brigade. In addition to this, a further delay took place on account of the impossibility of telephoning to Berlin, as the latter has no night service with Schonweide. In the meantime the fire extended rapidly, and the top floor of the building was soon in flames, and the fire was not extinguished until late in the afternoon. The top floor and roof were burnt out, and the stock of cotton, silk and jute destroyed, the damages being estimated at £20,000, but they are covered by insurance. It is not thought that any connection exists between the labour troubles and the conflagration, but that the latter was caused by spontaneous combustion of the cotton.

Runcorn Transporter Bridge.—The half-yearly report of the directors of the Runcorn Transporter Bridge Co. has been issued. In the report the directors say that since their last meeting difficulties have had to be contended with, but that the engineers anticipate that the bridge will be ready for traffic in about a fortnight.

Electricity Works and Tramways Statistics.—Since our annual Tables were issued, the following particulars have been received:—

Bedford.—Boilers, 6 B. & W., 2 Lanc.; engines, 2 Belliss, 6 Allen; generators, 3 Fynn, 2 Siemens, 1 G.E.C.; total capacity, 1,300 kw.; maximum load recorded, 630 kw.; mains, Henley's, Glover's, and T.M. Co., v. r. and lead-covered in c.-i. pipes and Doulton conduits, and Siemens direct; total capital expended, £111,070; private ltg., equiv. 8-c.p. lamps, 47,858; public lighting, 15 arc, 614 incandescent; No. and h.p. of private motors, 27 = 127 h.p.; total connections of all kinds in equiv. 8-c.p., 54,931; percentage increase during year, 9·5; prices charged per unit, ltg. 5d., pr. 1½d., pb. ltg. 3½d.; units sold during last complete year, 843,769; average price obtained per unit sold, 4·07d.; working costs, 1·61d.; total costs, 2·22d.

Burnley.—Engineer, James E. Starkie; pressures of supply, 110, 220 and 440 volts; boilers and auxiliaries, 5 Lanc., Meldrum 8-cell destructor with two additional Lanc. boilers; total capacity in kw., 1,490; maximum load recorded, 1,338 kw.; total capital expended, £87,765; private ltg. equiv. 8-c.p. lamps, 35,256; No. and h.p. of private motors, 80 = 216 h.p.; No. and h.p. of traction motors, 108 = 3,460 h.p.; total connections of all kinds in equiv. 8-c.p., 126,917; percentage increase during the year, 3·08; price charged per unit for traction, 1½d.; units sold during last complete year, 2,642,541; average price obtained per unit sold, 1·93d.; working costs, ·563d.; total costs, ·741d.

Edinburgh.—Units sold during last complete year, 11,651,743; average price obtained per unit sold, 2·43d.

Erith.—Boilers, 5 Lancashire; engines, 3 Allen, 2 Belliss; generators, 3 Int. Elec. Eng., 2 Westinghouse; total capacity, 1,350 kw.; maximum load recorded, 293 kw.; total capital expended, £51,649; private ltg., equiv. 8-c.p. lamps, 16,129; public ltg., 17 arc, 492 inc., 87 Nernst; h.p. of private motors, 53 h.p.; total connections of all kinds in equiv. 8-c.p. lamps, 17,359; percentage increase during year, 21 per cent.; prices charged per unit, pr. 3d., pb. ltg., £25 arc, £5·75 Nernst, £3·875 inc.; units sold during last complete year, 578,094; average price obtained per unit sold, 1·759d.; working costs, 1·484d.; total costs, 1·791d. The U.D.C. tramways have been supplied with energy since August 26th last.

Glossop.—Total capacity, 225 kw.; maximum load recorded, 200 kw.; public ltg., 32 Nernst; total connections of all kinds in equiv. 8-c.p., 17,119; prices charged per unit, ltg. 4½d., pr. 4d. and 1d. or 2½d., tr. 1½d.; systems of charging, flat and max. dem.; units sold during last complete year, 247,613.

Hebden Bridge.—Supply authority, U.D.C.; year of opening, 1905; engineer, James W. Garside; pressures of supply, 240 and 480 volts; continuous current; engine, 1 Campbell gas engine; generator, 1 Greenwood & Batley; total capacity, 140 kw.; maximum load recorded, 80 kw.; storage battery, Tudor, 200 kw.; mains, Anchor, paper, lead-covd., armd., direct; total capital expended, £9,435; private ltg., equiv. 8-c.p. lamps, 2,500; No. and h.p. of private motors connected, 12 = 50 h.p.; total connections of all kinds in equiv. 8-c.p., 3,500; prices charged per unit, ltg. 5d., pr. 2d.; system of charging, flat rate; units sold during last complete year, 34,229; average price obtained per unit, 4·1d.; wkg. costs, 2·6d.; total costs, 4·5d.

Horsham.—Supply authority, U.D.C.; year of opening, 1902; engineer, John B. Morgan; pressures of supply, 230 and 460 volts; continuous current; boilers, 3 B. & W.; engines, 3 Reavell; generators, 3 G.E.C.; total capacity, 280 kw.; maximum load recorded, 140 kw.; storage battery, E.P.S., 115 kw.; mains, Callender, v. bit., solid, J. & P. and B. I. & H. paper, lead covd. and armd., direct; total capital expended, £23,206; private ltg., equiv. 8-c.p. lamps, 6,310; public ltg., equiv. 8-c.p., 1,228; No. and h.p. of private motors, 10 = 18 h.p.; total connections of all kinds in equiv. 8-c.p., 8,130; percentage increase during year, 53 per cent.; prices charged per unit, ltg., 7d. and 3d. or 6d., pb. ltg. 4d., pr. 3d.; system of charging, maximum dem. and flat; units sold during last complete year, 114,965; average price obtained per unit, 4·88d.; wkg. costs, 2d.; total costs, 2·75d.

Lincoln.—Total capital expended, £51,499; average price obtained per unit, 3·78d.; wkg. costs, 1·06d.; total costs, 1·592d.

Oldham.—Maximum load recorded, 2,205 kw.; mains, by various makers; total capital expended, £269,155; total connections of all kinds, equiv. 8-c.p. lamps, 66,370; units sold during last complete year, 3,407,011; average price obtained per unit, 1·937d.; wkg. costs, 0·745d.; total costs, 0·937d.

Plymouth.—Boilers, 11 Lancs.; engines, 6 Belliss, 2 Ferranti; generators, 6 Ferranti, 4 Westinghouse; total capacity, 2,800 kw.; total capital expended, £137,095; private ltg., equiv. 8-c.p. lamps, 50,770; public ltg., 73 arcs; No. and h.p. of private motors, 46= 148 h.p.; No. and h.p. of traction motors, 66 = 1,650 h.p.; prices charged per unit, ltg. 4d., pr. 2½d., tr. 2d., pb. ltg. £21; units sold during last complete year, 1,699,460; average price obtained per unit, 2·9d.; wkg. costs, 1·05d.; total costs, 1·41d.

Shrewsbury.—Year of opening, 1895 (by Co.); boilers, 4 Lancs., 4 B. & W.; engines, 7 Belliss; generators, 7 Parker; total capacity, 780 kw.; maximum load recorded, 297 kw.; total capital expended, £48,595; public ltg., 51 arc, 180 inc.; No. and h.p. of private motors, 30 = 74 h.p.; total connections of all kinds, equiv. 8-c.p., 20,335; units sold during last complete year, 385,598; wkg. costs, 1·45d.

Tonbridge.—Total capacity, 120 kw.; maximum load recorded, 69 kw.; private ltg., equiv. 8-c.p. lamps, 4,557; public ltg., arc, inc., Nernst; No. and h.p. of private motors, 6 = 33 h.p.; total connections of all kinds, equiv. 8-c.p., 5,982; percentage increase during year, 40 per cent.; units sold during last complete year, 103,001; average price obtained per unit, 3·93d.; wkg. costs, 2·14d.; total costs, 2·89d.

Watford.—We regret that, owing to a printer's error, the total capacity of the plant was given in our list as 130 kw.; this should be 1,130 kw.; total capital expended, £54,000 (abt.)

West Ham.—Total capital expended, £318,273; private lighting, equiv. 8-c.p., 82,901; pb. ltg. = 10,917 8-c.p.; No. and h.p. of private motors, 141 = 720 h.p.; total connections of all kinds, equiv. 8-c.p., 111,813; prices charged per unit, lighting, 7d. and 2d., or 4d.; pr. 2d. to 1½d.; tr. 1·6d.; pb. ltg. £17; systems of charging, max. dem., flat, sl. scale, 2-rate meter, contract; units sold during last complete year, 4,078,055; average price obtained per unit, 2·5d.; total costs, 1·3d.

West Hartlepool.—Maximum load recorded, 564 kw.; mains, Callender, St. Helens, conc. armd. fdrs., triple conc. armd. dist., also Dialite, solid. Total capital expended, £76,421; private ltg., equiv. 8-c.p., 40,914; public ltg., 39 arc; No. and h.p. of private motors, 108=544 h.p.; total connections of all kinds, equiv. 8-c.p., 58,318; percentage increase during year, 17 per cent.; prices charged, over 200,000 units p.a., 1½d. to 1d.; system of charging, flat and sl. scale; units sold during last complete year, 700,787; average price obtained per unit, 2·7d.; wkg. costs, 1·09d.; total costs, 1·35d.

London.—Hackney.—Generators, 8 Johnson-Lundell (Holmes), 2 Brit. Westinghouse; maximum load recorded, 1,678 kw.; storage battery, Tudor, 800 kw. for 1 hr.; total capital expended, £273,897; private ltg., equiv. 8-c.p., 85,650; public ltg., 352 arc, 49 Nernst; No. and h.p. of private motors, 223=797 h.p.; total connections of all kinds, equiv. 8-c.p. lamps, 111,437; percentage increase during year, 8½ per cent.; prices charged per unit, ltg. 7d. and 1d., pr. 3d. and 1d., pb. ltg. £18, £16·75, £4; system of charging, maximum demand; units sold during last complete year, 2,548,803; average price obtained per unit, 2·73d.; wkg. costs, 0·57d.; total costs, 0·88d.

Correction.—We regret that an accidental transposition occurred in Part II. of our Electricity Supply Works Tables, whereby the names of the electrical engineers of Middlesbrough and Mexborough were interchanged. The list should read:—

Mexborough...	...	...	...	Mr. John Senior.
Middlesbrough	...	...	...	Mr. H. M. Taylor.

Electric Tramways:—

Dundee.—Miles of route, 12·65; weight of rails per yard, 94 lb. motor-cars, 48 d.d., 6 combination; brake equipments, hand mechanical, slipper, and electric. Power station equipment Engines, 11 Willans; generators, 3 Parker, 6 Siemens, 1 Dick Kerr, and 1 International Electrical Engineering; total capacity, 3,010 kw. Battery capacity and output: E.P.S., max. dis. 70 kw.; mains, B. I. and H., and Callenders. Capital outlaid on tramway and rolling stock, £266,884; annual electric car-mileage, 933,006; passengers carried per annum, 11,641,525; cost per car-mile, 7·13d.; ratio of expenses to receipts, 62 per cent.; works costs per unit, 1¼d.; combined lighting and traction station, energy being supplied by Dundee Gas Commissioners, who also undertake part upkeep of overhead work at an inclusive charge of 1½d. per unit.

Glasgow.—Miles of route, 76; motor-cars, 662 d.d.; maximum load, 8,517 kw.; capital outlaid on tramway and rolling stock, £2,210,820; capital outlaid on power station, £552,562; annual electric car-mileage, 17,943,595; passengers carried per annum, 195,767,519; cost per car-mile, 5·18d.; ratio of expenses to receipts, 50·42 per cent.; works costs per unit, ·3d.

Leeds.—Miles of route, 46·75; motor-cars, 269 d.d.; maximum load, 4,400 kw.; capital outlaid on tramway and rolling stock, £1,074,464; capital outlaid on power station, £119,251; annual electric car-mileage, 7,121,038; passengers carried per annum, 64,223,666; cost per car-mile, 5·5d.; ratio of expenses to receipts, 54·22 per cent.; works costs per unit, ·301d.

Salford.—Motor-cars, 150 d.d.; car motors, four 25-h.p. or two 30-h.p. per car; brake equipments, rheostatic; annual electric car-mileage, 4,884,590; passengers carried per annum, 39,213,560; cost per car-mile, 6·62d.; ratio of expenses to receipts, 64 per cent.

Wolverhampton.—Miles of route, 11·25; motor-cars, 28 d.d., 8 s.d., 4 combination. Power station equipment: Engines, two Willans, three Belliss, one Davey-Paxman. Generators, two Parker, four E.C.C. Maximum load, 2,380 kw.; capital outlaid on tramway and rolling stock, £250,000; annual electric car-mileage, 809,508; passengers carried per annum, 7,666,786; cost per car-mile, 6·55d.; ratio of expenses to receipts, 59·3 per cent.

The Electrical Labour Troubles in Berlin.—The Berlin correspondent of the *Times*, writing on October 1st, said that the workmen having decided not to accept the terms offered by Siemens & Halske, Siemens-Schuckert and the Allgemeine Elektricitäts Gesellschaft, these firms proceeded, on Saturday last, from a partial to a general lock-out, involving 33,000 people. The men's representatives appealed to the standing Court of Arbitration, which at once invited the employers to take the same step. The employers declined to submit their case to the Court as such, but intimated their willingness to hold a conference with the leaders of the men under the chairmanship of the president of the Arbitration Court, Magistratsrath von Schulz. The conference met on Sunday, and, after a very long sitting, adjourned till Tuesday without having come to any arrangement. It was feared that the workmen of the Berliner Elektrizitäts Werke, which supply motive power for the tramways and light for the whole city, would join in the strike, and endeavours were being made to find substitutes.

A Reuter telegram stated on the 29th ult. that the labour troubles threattened to involve the entire Berlin metal trade. The

Federation of Berlin Hardware Manufacturers had decided to declare a general lock-out, and had also resolved, in the event of a general lock-out by the electrical companies, to close the employment bureau, so as to prevent the strikers from obtaining employment elsewhere.

Later news in the *Times* says that on 2nd inst. the negotiations between the employers and the workmen were broken off. "The strike and lock-out thus seems destined to assume the character of an embittered struggle between capital and labour, which will last as long as the strike fund of the workmen holds out. The strike has now spread to a considerable section of the establishments of the Berliner Elektrizitäts Werke, which produce motive power for the tramways, and this morning several of the tramway lines had to run only half their usual number of cars." The number of people on strike is variously estimated at from 33,000 to 40,000.

On 3rd inst. the situation was unchanged, except that the strike had been extended to a number of subordinate branches of the industry.

Fatal Accident.—A skilled labourer, named James Forder, of the Brook, Chatham, fell 40 ft. from an iron girder, whilst working on the electrical power station which is in course of erection at H.M. Dockyard, Chatham, and died from the effects at the Royal Naval Hospital. The inquest on his body showed that he was the driver of a travelling crane, and at the time he fell was walking along the girders, but fell before he could reach the ladder. The deceased had (said Mr. Uriah Skinner, chargeman of the electrical works in the Dockyard) been warned not to walk on the girders.

OUR PERSONAL COLUMN.

[*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* Electrical Review *posted as to their movements.*]

Central Station Engineers.—At a meeting of the South Shields Tramways Committee, held on September 28th, it was decided to recommend to the Council for the second time, that Mr. J. H. Cawthra, borough electrical engineer, be also appointed general manager of tramways at an additional salary of £100 per annum, and that a traffic superintendent be advertised for at a salary of £150 per annum, rising by £10 per annum to a maximum of £200.

Mr. Walter J. Bache has now left Gloucester to take up his duties as borough electrical engineer at Cheltenham. Future letters should be addressed to him at the Electricity Department, High Street, Cheltenham. Communications relating to Gloucester should be addressed to his successor, Mr. G. R. White.

On the occasion of the recent marriage of Mr. H. H. Bowlan, assistant engineer and mains superintendent, the officials and employés of the Electricity Department of the Eastbourne Corporation assembled at the Electricity Works on Tuesday, 26th ult., for the purpose of presenting him with a handsome mahogany sideboard as a wedding present. The presentation was performed by Mr. Councillor A. H. Maude, the chairman of the Electricity and Street Lighting Committee, supported by his Worship the Mayor (Mr. Councillor C. F. Simmons), Mr. Alderman T. B. Rowe, the deputy chairman, and several other members of the Committee. The electrical engineer was then called upon, and made a few appropriate remarks. Mr. Bowlan briefly replied. The officials and employés concluded the evening with a smoking concert, Mr. Bowlan occupying the chair.

Mr. Butler has resigned the position of station engineer at the Dartford U.D.C.'s Electricity Works. For the vacancy, 115 applications have been received. The salary is £100 a year, with house, fuel and light.

The Ilford U.D.C. has decided not to entertain the application of Mr. A. H. Shaw, electrical engineer, for an increase of salary or a bonus for work done during the past two years in connection with the extensions. Mr. Shaw's salary is £450 per annum.

On Monday evening last, all grades of the West Ham Corporation electricity staff met together in the Committee room of the central station for the purpose of presenting to their retiring chief, Mr. W. J. W. Bullock, A.M.I.E.E., a slight token of that esteem which all those who have served under him at Canning Town have long felt. In quitting the borough of West Ham to enter upon the new sphere of work which Messrs. Bruce Peebles & Co. have invited him to take up as their chief contract manager, he had the hearty good wishes of all his friends. Mr. J. Eustace, the acting borough electrical engineer, made the presentation, which took the form of a handsome dress-suit case, with fittings complete, by Mappin & Webb, and, in doing so, made a neat little speech expressive of the regret that they all felt from their own personal standpoint at Mr. Bullock's departure. In returning thanks, Mr. Bullock said that he had been for more than five years associated with the electricity department of this borough, and before most of those then present were in the service of the Council, and though to the minds of most people West Ham was not the most delectable place wherein to pass one's life, yet, now that the parting hour had come, he could hardly repress a feeling of regret, and, perhaps, a stray shadow or two of doubt, as to what the future might hold for him. He reminded them of the very pleasant relations that had always existed between the members of the staff and himself, and thanked them most sincerely for their unswerving loyalty to him and to those he represented.

Mr. H. Eustace Sayer has taken up the position of engineer-in-charge in the Wallasey U.D.C. Electric Supply Works at Liscard. He has lately been connected with the Manchester Corporation.

The Ravensthorpe U.D.C. has retained the services of Mr. Mountain, of Huddersfield, as electrical engineer, for two years, at an inclusive fee of £105.

Mr. T. Nutter, a present member of the Burnley municipal electricity staff, has been appointed chief assistant at the Burnley Electricity Works, at a salary of £130 per annum. He succeeds Mr. Starkie, the new manager of the undertaking.

At a meeting of the Pietersmaritzburg (Natal) on September 5th, it was decided to appoint Mr. A. S. Munro, who had been acting borough electrical engineer for the past six months, to the permanent position, at a salary of £600 per year.

Tramway Officials.—The employés of the late Poole and District Electric Traction Co. have presented an illuminated address to Mr. W. A. Watts, who has for four years managed the undertaking. From the staff Mr. Watts received a set of silver-mounted carvers in case, a brass spirit kettle and stove, a drawing-room clock, and a smoker's cabinet.

A presentation has just been made to Mr. James McGivney, the chief inspector on the Wakefield and District Light Railway Co. on the occasion of his marriage. About 70 of the firm's officials and employés met at the Coffee Tavern to present him with a marble timepiece and a gold-mounted umbrella. Mr. Tate, the traffic superintendent, made the presentation. Afterwards an enjoyable smoking concert was held.

Mr. E. Edwards has resigned the position of general manager of the Gloucester Corporation Light Railways.

General.—Mr. F. E. Alexander is joining the staff of Messrs. E. P. Allam & Co., after many years with Messrs. Penrose and Co.

The *Times* announces that Mr. A. G. Cooke, M.A., head of the electrical department of Battersea Polytechnic, has been appointed principal of Paddington Technical Institute.

Mr. Ralegh B. Phillpots has been elected a director of the Underground Electric Railways Co. of London, Ltd., to fill a vacancy on the board.

Mr. Herbert Laws Webb has just returned from a month's trip on the Continent, devoted chiefly to looking into telephone progress. He visited Antwerp, Brussels, The Hague, Amsterdam, Rotterdam, Berlin, Munich, Berne and Paris, and inspected the telephone work and exchanged views with the telephone officials at those places. We understand that no very rapid development in the extension of telephony is occurring in any of the Continental countries, but the adoption of message rates in Germany has materially improved the rate of telephone development in that country, both in small places and in the large cities. The Berlin plant is being entirely reconstructed on the common battery system. In general, all new work on the Continent is being done in the common battery system, and with but one exception all the large Continental telegraph administrations have adopted the common battery system, and are not extending or reconstructing exchanges with magneto plant.

Mr. John E. Raworth (a nephew of Mr. J. S. Raworth) has opened an office at Queen Anne's Chambers, Westminster, and intends to practise there as a patent agent.

It is officially announced that Mr. S. A. A. Lindman is no longer Minister of Marine and Director-General of Telegraphs of Sweden. Mr. Sven Ludwig Herman Rydin is acting meanwhile as Director-General of Telegraphs.

We learn that Mr. Arthur Brooker has resigned his position as general manager of the Telephone, Telegraph and Signalling Department of the General Electric Co., Ltd., and has commenced practice as a consulting engineer at 60, King Street, Manchester. It will be remembered that Mr. Brooker, whose name is a household word among electrical engineers everywhere because of his position as joint author of Slingo and Brooker's "Electrical Engineering," left the service of the Government six years ago to join the General Electric Co. We wish him even greater success in his future connection with electrical engineering than he has already obtained, and that wish means a good deal.

The *Times* says that Mr. E. Garcke, the managing director of the British Electric Traction Co., was to leave London on a visit to Bombay. Is this in connection with the Bombay Co.'s concession from the municipality, about which an important controversy has been raging?

NEW COMPANIES REGISTERED.

British Electric Car Co., Ltd. (85,928).—This company was registered on September 25th, with a capital of £1,000 in £1 shares, to carry on in Preston, Lancashire, and elsewhere the business of manufacturers of and dealers in tramway cars for horse, electric and cable roads, vehicles for light railways, and all kinds of cars, carriages, vehicles and rolling-stock, whether worked by electricity, steam, gas, oil, horse or other power, &c. The subscribers (each with one share) are:—G. Richardson, 6, Montague Mansions, London, W.C., merchant; R. H. Prestwich, 13, Marsden Square, Manchester, cotton spinner R. S. Boddington, Strangeways, Manchester, brewer; J. Kerr, Abchurch Yard

E.C., contractor; R. B. Barningham, 41, Victoria Buildings, Manchester, iron merchant; L. C. Docker, Edgbaston, Birmingham, manufacturer; and L. Chandler, Abbotsfield, Kenilworth, engineer. No initial public issue. The number of directors is not to be less than four nor more than seven; the first are G. Richardson, R. H. Prestwich, J. Kerr, R. S. Boddington, R. B. Barningham, L. C. Docker and L. Chandler; qualification, £1; remuneration as fixed by the company. Registered office, United Electric Car Works, Strand Road, Preston.

Electric Railway and Tramway Carriage Works, Ltd. (85,929).—This company was registered on September 25th, with a capital of £1,000 in £1 shares. Objects, subscribers and all other particulars as in the British Electric Car Co., Ltd. Registered office, United Electric Car Works, Strand Road, Preston.

George F. Milnes & Co., Ltd. (85,930).—This company was registered on September 25th, with a capital of £1,000 in £1 shares. Objects, subscribers and all other particulars as in the British Electric Car Co., Ltd, Registered office, United Electric Car Works, Strand Road, Preston.

Bell Brothers & Co., London, Ltd. (85,951).—This company was registered on September 27th, with a capital of £500 in £1 shares, to adopt an agreement with H. E. Evans, carrying on business as an electrical contractor and dealer in electrical accessories, as Bell Brothers & Co., and to carry on the said business and that of an electric light company in all its branches. The first subscribers (each with one share) are:—G. Evans, 2, Cherborg Villas, Kenley, Surrey, engine driver; Mrs. L. Evans, 2, Cherborg Villas, Kenley, Surrey; E. H. Parr, 34, Winsteria Road, Lewisham, S.E., clerk; G. H. Harris, 52, Old Road, Rotherhithe, S.E., army reservist; Maude A. Harris, 52, Old Road, Rotherhithe, S.E., dressmaker; Mrs. E. K. Evans, 42, Whithead Road, Brockley, S.E.; and W. J. Evans, 110, George Lane, Lewisham, S.E., clerk. No initial public issue. Registered without articles of association.

CITY NOTES.

Willans & Robinson, Ltd.

Mr. Mark Robinson, chairman, presided on Wednesday at the Cannon Street Hotel, E.C., over the twenty-third half-yearly meeting of the above company.

The Chairman, in moving the adoption of the report, said that, in the unanimous opinion of the directors, the company was moving, although slowly, again towards prosperity. The business had followed a normal course, and there had been no new danger to avoid. Attention was called in the report to the fact that the loss shown in the half-year's accounts was a book loss. They were not poorer in cash from the last half-year's trading except to a small amount. The distinction was important, but they must not fancy that by doing only a little better they would find themselves making a profit. A loss due chiefly to depreciation was not a loss which called for counsels of despair, and it was useful to point this out, but, on the other hand, until the earnings were more than sufficient to cover the natural depreciation of their property, due to lapse of time and other causes, there could be no pretence that they were making a profit. Their high-speed engine business was, unfortunately, very unprofitable, for prices continued extremely low. On their gas engine business no final judgement could be passed at present. They had made some successful engines as regarded design and working, and had the best prospects of a technical success. The only question, as he had said before, was whether anyone would pay enough for such engines to make their manufacture profitable. For one's first engine of any type one must, of course, accept modest prices, and loss upon them was not very significant. What it was important to know was whether their success would be such, and would be so widely recognised, as to justify the comparatively high prices which seemed to be necessary for profitable gas engine work. This question could not be answered yet, but they had to reckon with one unfavourable fact, evolved since they undertook this branch of business. The defence of the steam engine against the aggression of the gas engine was very much stronger. The steam engine was now represented not by any of the older types so much as by the steam turbine, which was lower in price and lower in working cost than any of its predecessors. It was a more formidable opponent than the gas engine a few years back appeared to have before it, and, frankly, the prospects of the large gas engine were not what they were. They took up the gas engine as a matter of prudence, because the large gas engine threatened to supplant the large reciprocating steam engine. The steam turbine now threatened this result even more seriously, and so, in turn, they had taken up the steam turbine. If, therefore, their prudent attempt to turn the gas engine to their own purposes should be unsuccessful commercially, he should still deem it to have been a prudent step at the time it was decided upon, and they would have the pleasure of knowing that its still more successful rival was also on their side, and that its success would be theirs as well. The steam turbine was clearly assured, and there seemed to be no reason to doubt that this company would play an important part in developing it. A turbine of 1,400 kw. had been running for some months in one of the lighting stations of the Corporation of Glasgow, and they believed its running had been entirely satisfactory to the Corporation and its officers. Another turbine of 3,000 kw., say, 5,000 h.p., was being installed in the same station, and was nearly ready for steaming; and a third, of the same power as the second, would quickly follow. Four other turbines which they had put to work elsewhere had given great satisfaction, and they might safely say that they were fairly embarked in the turbine manufacture, on commercial lines, and might look forward with confidence to a satisfactory business, not less important than they had enjoyed at any previous time. The manufacture of the Diesel engine, to which reference had been made on former occasions, had been commenced. Queen's Ferry had been referred to in the report. They were satisfied that the proper course was being followed there, that was, not to shut it up, but to develop it gradually. Every effort was being made to keep down the working expenses, as well as the cost of manufacture; in this last some important economies were in view. The new vanadium steel, a speciality of the Queen's Ferry Works, was rapidly taking an important position in industry, and shareholders would be interested to learn that it was employed extensively in the manufacture of motor-cars by some of the best known makers. Much was to be hoped for from the development of this section of the business. Turning to the accounts, and beginning with the profit and loss account, it was not unsatisfactory to note that the manufacturing loss at Queen's Ferry had fallen in six months from £7,836 to £1,701. It was still a far cry from this to a profit large enough to cover depreciation and other general charges, but even this might be nearer than some of them thought. On the debit side the items of expenditure did not vary greatly from last time. As regarded advertising, it had been thought wise to spend a little more to bring the company's turbine manufacture well before the public, and the rapid growth of this business apparently justified the outlay. On the other side of the account, their royalties were swelled in respect of Niclausse boilers fitted in certain war vessels made under licence granted by this company. As regarded the accounts, he feared it was the balance itself which would most attract their attention. That this did not represent a loss in cash, except to a small extent, had been explained already; but he would like to say something with regard to a misunderstanding traceable in letters from more than one shareholder. Even if they regarded all the loss shown—namely, £102,854, as a true loss, it was not the case that they had lost any of their capital. In their prosperous days, they not only wrote off the whole of their goodwill to the extent of £37,879, but also put back into the business no less than £134,822 of their profits, which was the sum of the last three items on the debit side of the balance-sheet. Not until their loss exceeded this amount—and they confidently looked to be "round the corner" before any such amount was reached—would they have to face an actual loss of capital. So far they had but lost profit, and not even the whole of that which they had reserved. Some shareholders, perhaps over-appreciating this point, asked why they could not pay at least a small dividends out of their reserves. The answer was that their reserved profits, for the most part, were not accessible, and such as were accessible could not possibly be spared. It was true that the financial position was far stronger than a year and a half ago appeared possible, but they dared not presume upon this. To pay dividends out before they earned them would add nothing to their credit. Possibly somebody would point out that the item of debtors—the money owing to them by customers—had risen from £91,559 to £142,117. Importance seemed to be attached to these fluctuations; but he could assure them that they were absolutely accidental, and meant nothing. Since June 30th, the date of the balance-sheet, the amount had been down almost to the figure of the last accounts; whether it rose again or fell further was almost purely a matter of chance. Some of their correspondents reproached them for not holding out hopes of improvement. It seemed to them that the accounts themselves held out strong hopes of improvement; but when in times past they had spoken the fair things which they believed, and events had disproved them, they had had such severe reminders of the miscalculation afterwards, that they should not be surprised if they resolved to run no such risks in future, but leave the accounts in the main to speak for themselves.

Mr. Cousins seconded the motion.

A Shareholder asked what was the general cause of the bad business of the company.

The Chairman said it was due to low prices. It was a matter of notoriety that the makers of high-speed engines had cut prices, and in very few instances were they making profits.

The report was adopted without further discussion.

Dick, Kerr & Co., Ltd.

Mr. John Kerr, M.P. (chairman), presided on Thursday, September 28th, over the ordinary meeting of the above company held at the Cannon Street Hotel.

In moving the adoption of the report, the Chairman said that this time last year he not think anything he said as to the prospects of the year just ended took an attitude unduly optimistic, or even struck a note of pessimism. The board were alive to the keenness of competition in practically every department of their business operations. The spirit of competition and active rivalry of their competitors they had realised to the full. Practically in all trades they learned the same tale, and in only too many cases shareholders had had to suffer in the matter of diminishing dividends. He said, with pride, that they had fully maintained their position, and an examination of the balance-sheet would satisfy them on this point. Again, the directors had paid attention to that blessed word "efficiency." Everything that could make for economy of production had been studied and given effect to. In this direction there could be no slackening. As to the workmen, he would like to state his appreciation of their intelligence. Much that was said in praise of the German and American operative he was in sympathy with, but in this country, judging from his own experience, they had the best material in the world to draw from. During the year they had been carrying out operations in almost every part of the world, except in the highly protected countries of Europe and America. There they could get no footing, and expected none. It seemed strange that they had to struggle against German and American competition in this country on an equality, but they, with protective duties from 50 per cent. to 100

per cent., were secure in their own home market. If these foreign countries allowed the same terms to Great Britain as Great Britain did to them, he was sure they could soon find employment for double the workmen now on their pay sheet. All they asked was "a fair field and no favour." The preferential treatment given by some of the colonies was, they found, to their advantage. A strengthening of this development would, he felt sure, prove beneficial to the company, and to many other concerns. The net profits to be dealt with were £85,007 8s., which was £836 10s. 10d. better than in 1904. The amount of the reserve originally settled to be provided for was £150,000. As they were aware, that amount was made up last year, so that this liability had been discharged. This year it was proposed to take from the profits £23,388 16s. 2d., and coupled with a sum of £16,611 3s. 10d. previously reserved, but to no particular object, to open an account for "special reserve for extensions of manufactories or replacements of machinery, &c., or special depreciation of the same." An industrial concern should make a study of safeguarding itself in every direction. They all liked large dividends, but in these days of rapid change of machinery it was wise to provide a fund in excess of the ordinary ample depreciation, so that they could, if the necessity arose, either provide works extensions, or the most modern machinery without issuing fresh capital or taking from their year's profits. The special reserve fund for these purposes he hoped to see considerably augmented in the near future. He trusted they would support the board in their recommendation to set aside this very considerable amount of £40,000. The investments stood at £109,354 7s. 9d., as against £109,701 14s. last year, and he thought anyone would be fortunate if they could acquire them at that valuation. The amount in the bank was £90,609 12s. 3d. against £55,151 19s. 8d. last year, and the amount carried forward was £42,387 16s. 5d. against £39,922 11s. 4d. With regard to next year, all he could say was that, thanks to the energy of the staff, the order book was fuller than last year, but it was a question if the percentage of profit was as great. The business was extending in many directions, and if in the near future there should be less doing at home, their foreign connection might more than fill up the gap. The principles the company aimed at were to supply only the best materials and the best workmanship, and the customers they had secured to-day were to be their friends to-morrow.

The report was adopted, and subsequently several alterations in the articles of association, dealing with the mode of remunerating the directors, were carried.

The New Gutta-Percha Co.

Mr. Hugh Woolner (chairman) presided on Friday last over the third ordinary meeting of the shareholders of the above company, held at Winchester House, E.C.

In moving the adoption of the report, the Chairman said he should address himself chiefly to the item of gross profit on trading, £266 9s. 8d. It was a small trading profit, but this was due, not to the fact that their stuff was not all that was claimed for it, but because the attitude universally adopted by consulting engineers and other important customers was that, before they would recommend their clients to adopt this new material, they must be placed in the position to form their own opinion of it by the results of actual tests conducted in this country on a practical sale extending over a sufficient length of time. The duration usually insisted upon was from one to two years, and it was, of course, impossible for them to furnish testimonials from persons in this country over this length of time. He was glad to say that their customers now included the Admiralty, Great Western Railway, Midland Railway, London and South-Western Railway, London and Tilbury Railway, London and North-Western Railway, North British Railway, the Underground Electric Railways of London, Central London Railway, Great Northern and City Railway, South-Eastern Railway, L.C.C. Tramways, National Telephone Co., the Cotton Powder Co., the Electric Blasting Apparatus Co., Messrs. Rashleigh, Phipps & Co., Messrs. Middleton & Townsend, &c. The chairman proceeded to read a number of letters which had been received from various companies recording their experience of the company's products in high terms. One from Messrs. Middleton and Townsend gave particulars of a test made on a wire which had been subjected to a wet and dry process with a current of 230 volts. So far, the insulation had not broken down, nor did it show any signs of doing so. Mr. Chapman, the engineer of the Underground Electric Railways Co., wrote that at Chelsea he put a wire to the severest test possible for upwards of a year, and the material stood the test well. The letters he had received were not selected, for, as a matter of fact, they had not received a single letter expressing dissatisfaction. When he last addressed them he was led to anticipate a more rapid development of the commercial side of their business. The unqualified expressions of approval from the chief of the German telegraphic department led him to hope that if he could show that evidence over here, and produce certificates which they had already done from the German Post Office as to the behaviour of their cables, it would be an easy matter to induce consulting engineers and others over here to adopt their material, but they had found that they had had practically to wait until they had repeated in this country the tests which had been made for five years previously in Germany. The extracts he had read, showed that the commercial future of the company was assured. During the last few months the board had had certain negotiations in hand, and they had been gratified by the confidence which had been shown in them by the shareholders in leaving that matter in their hands for completion. They had found themselves under two disabilities. Firstly, it had been impressed on them by the Admiralty and other customers that they could not expect to get orders unless the goods were all British, and secondly, they found themselves up against the india-rubber and gutta-percha ring. They had to find remedies for this, and he was glad to say they had succeeded in both directions. With regard to the "all-British," they had completed satisfactory arrangements with Messrs. Johnson & Phillips, of Old Charlton, by which they would be able to obtain not only the necessary facilities for completing the manufacture of their wires and cables, but they also obtained the co-operation of this important firm in making their goods known to the trade. With regard to the second difficulty, they had made arrangements with Messrs. Veritys, Ltd., who had not only branches throughout the British Isles, but had large and important export connections. They had also opened negotiations, which looked like coming to a satisfactory conclusion, with another firm, which would secure for them a *clientèle* not touched by the other two firms he had mentioned. In connection with the arrangement with Messrs. Johnson & Phillips, they had decided to create a new company to be called the Pernax Cable Manufacturing Co., Ltd. Pernax, he should explain, was the name they had adopted for the quality of their material to be specially used for the insulation of land cables as opposed to Gentzsch, which they proposed to retain for that class of material which was used for submarine and subaqueous cables. The New Gutta-Percha Co. retained in their hands the manufacture of the raw material, and they would sell Pernax and Gentzsch to the Pernax Co. at a profit to themselves, and retain between two-thirds and four-fifths of the future profits earned by the sale of the finished products, or by the resale of Gentzsch and Pernax to other customers. In a short time the prospectus of the new company would be completed, and the shareholders would be given the opportunity of subscribing for the working capital shares. He hoped he had satisfied them that their position was defined, and their prospects assured. They were in the position of an architect who used concrete for the foundations of his building. They had perhaps used more concrete than they anticipated, and it had taken longer to set than they had thought, but it was now set and solidly laid, and before long they would have erected upon it a building of which they would be proud.

Mr. Beachcroft seconded the motion.

Replying to a number of questions, the Chairman said that in about two months the arrangement for the all-British manufacture would be completed. Arrangements were now being made for a quotation of the shares on the Stock Exchange. Negotiations were taking place with a French syndicate with regard to the French patents, which it was hoped would result in a substantial profit to the company.

The report was then adopted.

Mr. E. C. de Segundo (engineer) gave some particulars of the test made by Mr. Chapman on the company's wires, and also of tests made by the chief engineer of an electric railway. The wires were subjected to alternations of damp and dryness with a voltage of 500, and as a result the wire was now being used on the railway.

City of Buenos Ayres Tramways Co.

A general meeting was held at Winchester House on 28th ult. for the purpose of receiving the liquidators' account. Mr. H. A. Plumb (one of the joint-liquidators) said that the scheme of arrangement under which the company went into liquidation had been complied with. The actual handing over of the line to the Anglo-Argentine Tramways Co., Ltd., took place on December 31st last, and the report of the working of the lines during the period to that date was extremely satisfactory. With regard to the date when the liquidation would be concluded, he reminded them that this could not be until the whole of the tramway system formerly owned by their company had been electrified, and certain lands in Buenos Ayres, which, in that event, had to be reassured to them, sold, and the proceeds thus made available for distribution. There was a stipulation in the agreement that the Anglo-Argentine Co. should have the use of the various stations until the completion of the electrification; but they had given up possession of the Cinco Esquinas Station, which was considered to be a most valuable site.

Mersey Railway Co.

Mr. J. Falconer presided on 29th ult. at the half-yearly meeting of this company held at Worcester House, Walbrook, E.C. In moving the adoption of the report (see Electrical Review, September 29th), he said it was a pleasure to state that the receipts had made steady progress. The figures showing the increase in passengers carried were specially interesting, having regard to the course of events since the substitution of electrical for steam traction. The booked passengers numbered 2,844,708 for the December half of 1904, and 4,862,378 in the six months ended June last. The receipts from season-tickets had risen during the same period from £2,646 to £4,791. Thus there had been a steady increase since electrical working was introduced, and the improvement was manifested in both local and through traffic. During the 12 weeks which had elapsed since the commencement of the current year the upward tendency had continued, showing that the line was serving a great public want, and that the methods adopted for meeting the public requirements had gained general approval. There was still, however, a large volume of traffic to draw upon.

The position was really more satisfactory than the figures he had given would seem to indicate, for during the last years of steam traction the company were not holding their own. Their traffic was then going down almost as fast as it was now ascending. The company still had a long way to go, but they were making progress. The working expenses were about equal to those of the corresponding half of last year. One of the satisfactory features in connection with the "electrification," was that the line was capable of dealing with practically any growth of traffic that might ensue, without any considerable increase in working expenses. It had been found that in certain respects the tramway system of Birkenhead did not afford all the conveniences which the company's passengers needed for conveyance to and from the stations. The board had, therefore, resolved to provide a service of motor-omnibuses.

In reply to various questions, the Chairman said that the working costs at the present time were about the same as they were under steam traction, but the train service was between two and three times as good. The cost per train-mile had been reduced from nearly 1s. 2d. to 6d. The success of the line depended almost solely upon the development of its traffic. There were possibilities in connection with the line which anyone studying it could understand. There were various connections and developments under consideration.—The report was adopted.

Prospectuses.

The Burgess Hill and District Electric Supply Co., Ltd.—This company is at present inviting subscriptions for an issue of 1,000 preference and 1,500 ordinary shares of £1 each at par. The nominal capital is £5,000. The company proposes to supply electricity in Burgess Hill and district at 6d. per unit, in competition with gas at 4s. 3d. per thousand. The greater part of the distribution will be effected by means of overhead wires, the prospectus stating that they are cheaper, more efficient and easier to manage. Mr. Napier Prentice, of Stowmarket, Suffolk, is the consulting engineer. The office of the company is at the Railway Approach, Burgess Hill. The prospectus remarks:—"At the present time many small towns of similar size to Burgess Hill—*e.g.*, Felixstowe, Stowmarket, Diss and Walton-on-the-Naze are making a handsome profit on their electric lighting undertakings, and the directors feel assured that this company will reap the same results, and that a substantial dividend may reasonably be expected."

The Japanese and Eastern Corporation, Ltd., are offering, until to-day, an issue of £1,000,000 5½ per cent. profit-sharing perpetual debenture stock at a premium of 5s. per £ stock. The object of the Corporation is to establish a general financial and trust business for the investment of capital in Japan and the Far East generally, but mainly to aim at obtaining the financing of important schemes and undertakings, such as tramways, electric lighting, railways, docks, &c For such operations it is believed there is large and remunerative scope. It will also conduct, as may be considered advisable, commercial and trading relations with Japan and her protectorates and dependencies; and generally assist in the industrial development of these countries.

Bruce Peebles & Co., Ltd.—This company has paid an interim dividend on the original issue of its preference shares at the rate of 6 per cent. per annum for the half-year to June 30th, 1905, and on the recent new issue of preference shares at the rate of 6 per cent. per annum for the period ending June 30th, 1905, and the dividend warrants have been posted.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

Bournemouth and Poole Electricity Supply Co., Ltd.—Further issue of 3,000 ordinary shares of £10 each, fully paid, Nos. 27,001 to 30,000.

The Committee has appointed a special settling day as under, and has ordered same to be officially quoted:—

Thursday, October 12th.—Babcock & Wilcox, Ltd.—Further issue of 270,000 ordinary shares of £1 each, Nos. 530,001 to 800,000.

Buenos Ayres Electric Tramways Co. (1901).—The third annual meeting was held on Monday, Mr. C. Seymour Grenfell presiding. He said that during the year the company had been hampered by construction work, and they only commenced running over the whole of the route in the middle of last November. The figures in the report, therefore, did not really represent the earning power of the system. Since then the company had done much better. The report was adopted.

Edison & Swan United Electric Light Co.—The directors have resolved to recommend a dividend for the year ended June 30th of 2½ per cent. per annum on the "A" shares, less tax. We tender our hearty congratulations to the company upon its return to the category of dividend-paying concerns. We trust that the bad times have now been permanently left behind. After paying this dividend (£9,587), £7,622 is carried forward. The directors' report will be published in our next issue.

South Metropolitan Electric Light and Power Co.—The warrants for the payment of the interest on the 4½ per cent. first mortgage debenture stock, payable on October 1st, have been posted.

Direct United States Cable Co.—The board has resolved upon the payment of an interim dividend of 3s. per share, free of income-tax, being at the rate of 3 per cent. per annum for the quarter ending September 30th, 1905, such dividend to be payable on and after the 26th inst. The rate for the corresponding quarter last year was the same.

STOCKS AND SHARES.

Wednesday evening.

Various reasons combine to make the general markets of the Stock Exchange somewhat dull. The principal cause for the weakness is to be found in the growing demand for money, which has raised the Berlin Bank rate to 5 per cent., and may send up the Threadneedle Street rate before the end of the year. Some of the markets, however, manage to evade the general dulness, and Home Rails are not affected as much as might have been anticipated.

Central Londons are a firm spot, the Ordinary and Deferred again advancing this week. Rumours are afloat as to the possibility of expenses being reduced by the introduction of a new mechanical appliance, but the cheapness of the stocks, apart from this, has formed the subject of recent comment here. The Deferred now stands at 84½, and it should go to 90. Waterloo and City, which is still peculiarly affected by Money Market considerations, is down a point to 90. Metropolitan Consolidated at 90 and Districts at 34½ have not moved much. There is a fair amount of business in East London Railway stocks. The Ordinary has risen to 5½, and the Third Debenture stock, the subject of some little speculation, is about twice that figure. The Seconds improved to 30, and the Fourth Debenture is nominally 5—8. If the Ordinary stock be worth 5½, the Fourth Debenture should not stand at the same value, unless the former is being bought for purposes of control, a supposition advanced in certain quarters. The worst of dealing in such stocks as these is their unnegotiability, which causes the market to be all buyers for one day, and all sellers, perhaps, for weeks afterwards.

Traction issues manifest a good deal of life. British Electrics continue dull at 9¾, but some of the lower-priced shares are coming to the fore. Anglo-Argentine Ordinary at 8 1/16 are *ex* the dividend of 3s., and are that amount better, while the Preference stay at 6. British Columbia Deferred is 4 harder at 125½, the Preference remaining at 105½. Auckland Debenture is better at the same quotation as British Columbia Preferred. The 2½ per cent. interest on Hastings Tramways Debenture came off at the end of last month, and has been partly recovered in the present price of 101. London United Preference are 10, Metropolitan Electric Tramways Preference a guinea, and the Deferred 5s. No change in Belgrano Ordinary leaves the shares at 3⅞, and business has been done at 5¾ in City of Buenos Ayres Tramway shares.

Electric lighting issues are nearly stationary, three or four declines were caused by deduction of dividends from prices. The action of the Court of Common Council in substituting gas for electricity in the City streets is not considered sufficient reason to lower quotations for "City Lights," indeed, the tone is a trifle harder, and the Preference rose ½ to 14. Is there to be a *rapprochement*, we wonder, between the City of London and the Charing Cross, City Undertaking, Companies? Urban Ordinary and Preference are both *ex* 2s. 6d. dividend. Amongst Debentures, Edmundson's 4½ per cent. is another point to the good at 109. Kalgoorlie Electric Preferred stiffened to 1, and there is a little doing in the Ordinary shares at 4s. River Plate Electric Preference are a good market, changing hands at 21s. 3d., and those who take up the Ordinary will have a good speculation at 13s. or thereabouts. Another six months might easily see a rise of as many shillings in the price. Perth Tramway Ordinary at 11s. 3d. are also a healthy speculative purchase.

Speaking in comparatives, the Edison and Swan report is quite brilliant. The profit of £9,000 goes against a loss of £2,000 in the previous year, and the "A" shares are now to receive 6d. a share dividend, after an interval of three years lack of anything. The price responded to the announcement with a 5s. rise, making it 30s., and the Second Debenture stock is 3½ up, allowance being made for the dividend. On the other hand, Electric Constructions fell ½ to 15s. Rubber and Cable shares are good, rises of 10s. each being credited to Callenders at 11, British Insulated at 6½, and Telegraph Construction at 35. India-Rubber shares remain at 16, and in view of the remarkable increase in the demand for rubber, caused chiefly by development of motor traction, holders would be ill-advised to sell when an improvement appears probable. Westinghouse Preference, by the way, are 2½, and the Debenture stock 87. British Thomson-Houston 4½ per cent. Debenture stand at 99.

Changes in the Telegraph market are irregular. While Anglo-American Deferred dropped ¼ upon liquidation of a "bull" account, the Preferred gained ½ at 109, thanks to investment purchases. Amazon shares have shed their last week's rise of 5s., but Direct Spanish Preference are unaltered at 9½, though *ex* 5s. dividend. West India and Panama Preference put on 10s., and so did Indo-Europeans and Great Northerns. Eastern stocks did not move upon the declaration of interim distributions. Globe Telegraph Trust Preference at 14⅜ are ½ down.

Telephone varieties show losses of ¼ in National Preferred and 3½ per cent. Debenture. Chili Telephones have weakened a shade, but at 111 United River Plate Debentures show ½ rise.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. ‡	Dividends for the last four years. 1902.	1903.	1904.	1905. §	Closing Quotations Sept. 27th.	Closing Quotations Oct. 4th.	Business done week ended Oct. 4th, 1905. Highest	Lowest.	Rise + or Fall —
34,800	African Direct Telegraph, 4 % Debs...	100	4 %	4 %	4 %	..	99 —102	99—102	..	..	..
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	3⅛ — 3⅜	3 - 3⅛	3	..	..
119,700£	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	Nil	Nil	..	82 — 87	82 — 87	84	..	..
763,580	Anglo-American Telegraph	Stock	60/6	61s.	23%	29s. §	61 — 63	61 — 63	62½	..	..
3,118,210	Do. do. do. 6 % Pref.	Stock	6 %	6 %	5⅛%	58s. §	108 —109	108½—109½	109¼	108½	+ ½
3,118,210	Do. do. do. Deferred	Stock	1/-	2s.	Nil	..	17 — 17½	16⅝— 17	17⅛	16⅝	— ⅛
44,000	Chili Telephone, Nos. 1 to 44,000	5	6 %	7 %	8 %	..	7⅛ — 7¼	7⅛ — 7⅜	7⅜	7⅛	— ⅛
1,962,856£	Commercial Cable Stlng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	..	98 —100	97 — 99	98¼	97½	..
16,000	Cuba Telegraph	10	6⅔%	10 %	5 %	..	9 — 9½	9 — 9½	..	..	..
6,000	Do. 10 % Pref.	10	10 %	5 %	10 %	..	17⅜— 18½	17⅜— 18½	..	..	..
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %§	3⅜— 3⅝	3⅜— 3⅝xd	3⅝	..	..
6,000	Do. do. 10 % Cum. Pref.	5	10 %	10 %	10 %	10 %§	9½— 9⅝	9½— 9⅝xd	..	..	..
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%§	100 —103 %	100 —103	..	..	..
60,710£	Direct United States Cable	20	3⅛%	3 %	3⅛%	3 %§	11⅞— 12⅛	11⅞— 12⅛	12⅛	11⅞	..
74,500	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	..	100 —102	100 —102	..	..	..
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	5 %§	144 —147	144 —147	145½	144½	..
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	3½%§	90 — 92	90 — 92	91½	90½	..
1,836,814	Do. 4 % Mort. Deb. Stock Red.	Stock	4 %	4 %	4 %	4 %§	108 —110	108 —110	108½	..	..
300,000	Eastern Extension, Australiasia, and China Tele.	10	7 %	7 %	7 %	6 %§	13⅜— 14½	13⅜— 14½	14½	14	..
602,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %§	106 —108	106 —108	107½	106½	..
300,000	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	..	99½—101½	99½—101½	102½	..	..
200,000£	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	..	101½—103½%	101½—103½	..	..	..
180,887	Globe Telegraph and Trust	10	£3 16 7*	5⅛%	5⅜%	..	10⅜— 11	10⅜— 11	11	10⅛	..
180,887	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	14⅜— 14⅝	14⅛— 14⅜	14⅜	..	— ⅛
150,000	Great Northern Telegraph, of Copenhagen	10	12½%	15 %	24 %	..	35 — 36	36 — 37	35⅞	..	+1
46,500	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	..	100 —102	100 —102	..	..	..
17,000	Indo-European Telegraph	25	10 %	10 %	13 %	..	52½— 54½	53 — 55	54⅜	53	+ ½
72,680	Monte Video Telephone Co., Ltd. Ord.	1	3 %	3 %	..	..	7/16— ½	..	..	..	..
1,983,333	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %§	112½—113⅜	112 —113	112⅜	112⅛	— ⅛
1,966,667	Do. do. Def. Stock	100	4½%	5 %	5 %	5 %§	107 — 109	107 — 109	108½	107⅛	..
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %§	13½— 14½	13½— 14½	..	..	..
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %§	12 — 13	12 — 13	12½	12⅜	..
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %§	5⅜— 5⅝	5⅜— 5⅝	5⅝	5⅜	..
2,000,000	Do. do. 3½ % Deb. Stock Red.	Stock	3½%	3½%	3½%	..	99½—101½	99 —101	100½	99½	— ½
1,689,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	..	104½—106½	104½—106½	105⅜	104½	..
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid	1	6 %	6½%	6½%	..	1⅛— 1⅜	1⅛— 1⅜	1⅛	..	..
50,000	Do. do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..
100,000	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	..	100 —103	100 —103	..	..	..
11,839£	Reuter's	8	5 %	5 %	5 %	..	8 — 8½	8 — 8½	..	..	..
3,237	Submarine Cables Trust	Cert.	6 %	6 %	6 %	..	127 —130	127—130	..	..	..
58,000	United River Plate Telephone	5	7 %	8 %	8 %	..	7 — 7⅛	7 — 7⅛	..	..	..
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	..	5⅛— 5⅜	5⅛— 5⅜	..	..	..
179,947	Do. do. 5 % Debs.	Stock	5 %	5 %	5 %	..	109⅜—111¼	110 —112	..	..	+ ¼
15,609£	West African Telegraph, Shares	10	2 %	4 %	4½%	..	10 — 10⅜	10 — 10⅜	..	..	..
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	Nil	Nil	Nil	..	3/16— ¼	3/16— ¼	..	..	..
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	..	100 —102	100 —102	..	..	..
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980	10	7 %	7 %	7 %	..	14 — 14½	14 — 14½	14⅜	14⅛	..
75,000	Do. do. 5 % Debs, 2nd series, 1906	100	5 %	5 %	5 %	..	101 —103	101 —103	..	..	..
563,380	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	..	102½—104½	102½—104½	103⅜	103⅛	..
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	1/16— ⅛	1/16— ⅛	..	..	..
34,563	Do. do. 6 % Cum. 1st Pref.	10	7 %	7 %	6 %	..	8½— 9	8⅛— 9	9	8⅛	..
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	..	7 — 7½	7⅞— 8	8	7⅛	+ ⅛
80,000£	Do. do. 5 % Debs., Nos. 1 to 1,800	100	5 %	5 %	5 %	..	101 —104	101 —104	..	..	..

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

40,000	British Aluminium 7 % Cum. Pref.	5	Nil	Nil	Nil	..	4⅜— 5⅛	4⅜— 5⅛	5⅛	..	..
20,000	Do. do. "A" 6 % Cum. Pref.	5	Nil	Nil	Nil	..	4⅜— 5⅛	4⅜— 5⅛	..	..	..
20,000	Do. do. 4 % Funding Certs.	5	..	..	..	..	3⅜— 3⅝	3⅜— 3⅝	..	..	..
800,000£	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	..	99 —103	99 —103	..	..	..
133,801	British Electric Traction	10	8 %	6 %	6 %	..	9 — 9½	9 — 9½	..	..	..
156,457	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	..	10½— 11	10½— 11	10⅝	9⅜	..
1,000,000£	Do. do. 5 % Perp. Deb. Stock	Stock	5 %	5 %	5 %	..	123 —125	122 —124 xd	122¾	122¼	..
235,880	Do. do. 4½ % 2nd Deb. Stock Red.	100	..	..	4½%	..	99 —101	99 —101	100½	99	..
100,000	British Insulated and Helsby Cables	5	10 %	8 %	8 %	8 %§	5⅞— 6⅛	6⅛— 6⅜	..	..	+ ½
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %§	5⅞— 6⅛	5⅞— 6⅛	..	..	..
600,000	Do. do. 4½ % 1st Mort. Deb. Red.	100	4½%	4½%	4½%	4½%§	103 —106	103 —106	..	..	..
50,000	¶Browett, Lindley & Co., Ord.	£1	Nil	Nil	Nil	..	⅝— ¾	⅝— ¾	..	..	..
50,000	¶ Do. do. 6 % Cum. Pref.	£1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..
105,731	Brush Electrical Engineering, Ord., 1 to 105,731	2	Nil	Nil	Nil	..	⅞— ⅞	⅞— ⅞	..	..	..
150,000	Do. Non-cum. 6 % Pref.	2	6 %	6 %	6 %	..	1⅞— 1¾	1⅞— 1¾	1⅞	..	..
125,000£	Do. 4½ % Perp. Deb. Stock	Stock	4½%	4½%	4½%	..	91 — 94	91 — 94	..	..	..
125,000£	Do. 4½ % Perp. 2nd Deb. Stock	Stock	4½%	4½%	4½%	..	78 — 81	78 — 81	..	..	..
35,000	Callender's Cable Construction shares	5	15 %	12½%	12½%	..	10 — 11	10½— 11½	11⅛	11	+ ½
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅜— 5⅝	5⅜— 5⅝	..	..	..
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	..	109 —111	109 —111	..	..	..
963,208	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	4 %§	90 — 92	91 — 93	92½	91	+1
523,896	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %§	101 —103	101 —103	..	..	..
523,896	Do. do. Def. do.	Stock	4 %	4 %	4 %	..	82 — 85	83 — 86	85½	84	+1
1,330,000	City and South London Railway	Stock	3½%	2¾%	2½%	2 %§	40 — 42	40 — 42	41½	40⅞	..
85,000	Crompton & Co., Nos. 1 to 85,000	3	5 %	2½%	2½%	..	1⅞— 1⅞	1⅞— 1⅞	..	..	..
100,000£	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	..	95 —100%	95 —100 %	..	..	..
99,261	Edison & Swan Utd., "A" shrs., £3 pd., 1 to 99,261	5	Nil	Nil	2½%§	..	1⅛— 1⅜	1⅛— 1⅜	1⅛	1⅜	..
17,139	Do. "A" shares, 01—017,139	5	Nil	Nil	2½%§	..	2 — 2¼	2 — 2¼	2⅛	2¼	..
344,023£	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	..	83 — 88	83 — 88	..	..	..
100,000£	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	89 — 94	90 — 95 xd	..	..	..
112,100	Electric Construction 1 to 112,100	2	6 %	4 %	Nil	..	⅜— 1	⅜— ⅝	..	..	— ⅛
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	..	1⅞— 2⅛	1⅞— 2⅛	..	..	..
200,000	Do. do. 4 % Perp. 1st Mort. Deb. Sk.	Stock	4 %	4 %	4 %	..	92 — 95	92 — 95	..	..	..
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	9⅜— 10	9⅜— 10	..	..	..
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	..	97 —101	96 —100	..	..	—1
200,000	Henley's (W. T.), Telegraph Works, Ord.	5	20 %	15 %	15 %	10%§	12 — 13	12 — 13	12⅛	12⅛	..
200,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	..	5⅛— 5⅜	5⅛— 5⅜	5⅜	5 31/32	..
45,900	Do. do. 4½ Mort. Deb. Stock	Stock	4½%	4½%	4½%	..	109 —111	109 —111	..	..	..
50,000	India-Rubber, Gutta-Percha & Telegraph Works.	10	10 %	10 %	5 %	2½%§	15½— 16½	15⅝— 16½	15⅝	15½	..
300,000£	Do. do. 4% 1st Mort. Deb.	100	4 %	4 %	4 %	..	99 —102 xd	99 —102	..	..	..
37,500	†Liverpool Overhead Railway, Ord.	10	1½%	1⅜%	1½%	..	2⅜— 2⅝	2 7/16— 2 9/16	..	..	— 1/16
10,000	† Do. do. Pref. £10 paid	10	5 %	5 %	5 %	5 %§	9 — 9½	9 — 9½	..	..	..
37,350	Telegraph Construction and Maintenance	12	20 %	20 %	15 %	..	33½— 35½	34 — 36	35	34½	+1
150,000£	Do. 4 % Deb. Bds., 1 to 1,500 Red. 1909	100	4 %	4 %	4 %	..	102 —104	102 —104	..	..	..
540,000£	Waterloo & City Railway, Ord. Stock	100	3⅛%	3⅛%	3⅛%	3 %§	90 — 92	89 — 91	90½	..	—1

* A period of nine months. † Quotations on Liverpool Stock Exchange. ‡ Unless otherwise stated all shares are fully paid. § Interim dividends. ¶ From Manchester Share List.

Bank rate of discount 4 per cent (September 28th, 1905).

SHARE LIST OF ELECTRICAL COMPANIES *(continued)*.—ELECTRICITY SUPPLY COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1902.	1903.	1904.	§1905.	Closing Quotations Sept. 20th.	Closing Quotations Oct. 4th.	Business done week ended Oct. 4th, 1905. Highest	Lowest.	Rise + or Fall −
29,377	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	† 5	8 %	10 %	10 %	..	9¾ — 10¼	9¾ — 10¼	..	..	..
29 623	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	9⅞ — 10⅛	9⅞ — 10⅛	..	..	..
10'782	Central Electric Supply 4 % Guar. Deb. Stock ..	100	4 %	4 %	4 %	..	103 —106	103 —106	105	..	..
80,000	Charing Cross and Strand Electricity Supply ..	5	10 %	8 %	8 %	5 %§	6¾ — 7⅛	6¾ — 7⅛	..	..	..
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½ %	4½ %	4½ %	..	5⅛ — 5⅜	5⅛ — 5⅜	5⅜	..	..
40,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½ %	4½ %	4½ %	..	4¾ — 5	4¾ — 5	..	..	..
40,000	Do. do. 1903	5	..	4½ %	4½ %	..	4⅝ — 5⅛	4⅝ — 5⅛	..	..	..
350,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	..	103 —105	103 —105	104	..	..
44,436	Chelsea Electricity Supply, Ord.	5	4½ %	5½ %	6 %	4½ %§	5⅜ — 6⅛ xd	5⅜ — 6⅛	..	..	..
150,000£	Do. do. 4½ % Deb. Stock Red. ..	Stock	4½ %	4½ %	4½ %	4½ %§	108 —110	109 —111	..	..	..
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	5 %	5 %	6 %	..	11 — 11¼	11 — 11¼	11⅜	..	+ ⅛
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	..	13 — 14	13½ — 14½	13⅞	13⅜	+ ½
400,000£	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	..	124 —128	124 —128	..	..	..
300,000	Do. 4½ % 2nd Db. Stk., Prov. Crts., all pd.	100	4½ %	4½ %	4½ %	..	104 —106	104 —106	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4 %	4 %	4½ %	4 %§	8⅜ — 9⅛	8¾ — 9¼	..	..	..
30,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	..	12 — 12½	12 — 12½	12⅜	..	..
400,000£	Do. do. 4½ % Deb. Stock ..	..	4½ %	4½ %	4½ %	..	111 —114	111 —114	113	..	..
250,000	Do. do. 4½ % 2nd Deb. Stock ..	Stock	4½ %	4½ %	4½ %	..	103 —105	103 —105	104⅜	..	..
70,000	Edmundson's Electric Corporation, Ord. Shares ..	5	7 %	7 %	7 %	..	5⅜ — 6½	5⅜ — 6½	5 13/16	5 7/16	..
80,000	Do. do. 6 % Cum. Pref.	..	6 %	6 %	6 %	..	6⅛ — 6⅜	6⅛ — 6⅜	6 5/16	6 3/16	..
300,000£	Do. do. 4½ % 1st Mort Deb. Stk	100	4½ %	4½ %	4½ %	..	106 —108	108 —110	109½	108⅜	+2
21,000	Kensington and Knightsbridge Electric Ord. ..	5	10 %	12 %	12 %	..	12 — 12⅜	12 — 12⅜	..	..	..
136,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	..	97 —100	97 —100	..	..	..
111,000	London Electric Supply Corporation, Limited, Ord.	3	Nil	Nil	3 %	..	2 — 2⅛	2 — 2⅛	..	..	..
60,000	Do. do. do. 6 % Pref...	5	6 %	6 %	6 %	..	4⅞ — 5⅜	4⅞ — 5⅜	5⅛	5 1/16	..
371,895	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	..	99 —102	99 —102	..	..	..
100,000	Metropolitan Electric Supply, 1 to 100,000	5	7½ %	8½ %	10 %	10%§	10⅜ — 11⅛	10⅛ — 11	10 13/16	10⅛	..
76,121	Do. 4½ % Cum. Pref. 1—71,106, £3 pd.	5	4½ %	4½ %	4½ %	..	5⅜ — 5⅝	5⅜ — 5⅞	5 13/16	5⅜	..
220,000£	Do. 4½ % 1st Mort. Deben. Stock ..	..	4½ %	4½ %	4½ %	..	109 —113	109 —113	..	..	..
250,000£	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½ %	3½ %	3½ %	..	100 —102	100 —102	..	..	..
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½ %	4½ %	4½ %	..	100 —102%	100 —102%	..	..	..
10,852	Notting Hill Electric Lighting	10	6 %	6 %	7 %	..	14 — 15	14 — 15	..	..	..
59,000	Do. do. 4 % 1st Mort. Deb... ..	100	4 %	4 %	4 %	..	100 —102	98 —100 xd	..	..	..
40,000	St. James' and Pall Mall Electric Light, Ord. ..	5	14½ %	14½ %	14½ %	10%§	13½ — 14½	14 — 15	14⅜	..	..
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %§	8 — 9	8 — 9	..	..	..
150,000£	Do. do. 3½ % Deb. Stock Red. ..	100	3½ %	3½ %	3½ %	..	98 —100	98 —100	..	..	..
12,000	Smithfield Markets Electric Supply, Ord.	5	2½ %	4 %	4 %	..	2¼ — 2⅜	2¼ — 2⅜	..	..	..
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	..	76 — 80	76 — 80	..	..	..
65,000	South London Electricity Supply, Ord.	5	12½ %	3 %	4 %	..	3¼ — 4	3¼ — 4	..	..	..
100,000	South Met. Elec. Lt. & Power (Ord..	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..
50,000	*(Late Blackheath and Greenwich* 7 % Pref...	1	Nil	7 %	7 %	..	1 1/16 — 1 1/16	1 1/16 — 1 1/16	..	..	..
100,000	*Dist. E.L.Co.)* 4½ % 1st Deb. Stk.	100	4½ %	4½ %	4½ %	..	106 —109	105 —108 xd	..	..	..
30,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	4⅜ — 5	4⅜ — 4⅞ xd	..	..	..
30,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅜ — 5⅝	5 — 5½ xd	..	..	..
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red	100	..	..	4½ %	..	105 —107	103 —105 xd	104	103⅜	..
110,000	Westminster Electric Supply, Ord.	5	12 %	13½ %	14 %	13%§	12⅜ — 13½	12⅜ — 13½	13	12⅜	..
28,151	Do. do. 5 % Cum. Pref. ..	5	5 %	5 %	5 %	..	6⅛ — 6⅜	6⅛ — 6⅜	6 1/16	..	..

Shares not officially quoted :—Mackay Companies, ord., 47½—47⅞. Pref. 76—76½.

† Unless otherwise stated all shares are fully paid. § Interim dividends.

MARKET QUOTATIONS, Wednesday, October 4th.

	CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a	Acid, Hydrochloric	per cwt.	5/-	..
a	,, Nitric	per cwt.	22/-	..
a	,, Oxalic	per cwt.	32/-	..
a	,, Sulphuric	per cwt.	5/6	..
a	Ammoniac, Sal	per cwt.	42/-	..
a	Ammonia, Muriate (crystal) ..	per ton	£33 10	..
a	,, ,, ...	per ton	£30	..
a	Bleaching powder	per ton	£5 10	..
a	Bisulphide of Carbon	per ton	£15	..
a	Borax	per ton	£13	..
a	Benzole (90 %)	per gal.	10d.	..
a	,, (50 %)	per gal.	9½d.	..
a	Copper Sulphate	per ton	£20	..
a	Lead, Nitrate	per ton	£25	..
a	,, White Sugar..	per ton	£31	..
a	,, Peroxide	per ton	£27 10	..
a	Methylated Spirit	per gal.	2/6	..
a	Naphtha, Solvent (90 % at 160° C)	per gal.	5/6	..
a	Potassium Bichromate, in casks	per lb.	3d.	..
a	Potash, Caustic (75/80 %) ..	per ton	£20	..
a	Potassium Cyanide	per lb.	7½d.	..
a	Shellac	per cwt.	190/-	..
a	Sulphate of Magnesia	per ton	£4 10	..
a	Sulphur, Sublimed Flowers ..	per ton	£6 10	..
a	,, Recovered	per ton	£5 10	..
a	,, Lump	per ton	£5	..
a	Soda, Caustic (white 70 %) ..	per ton	£10 15	..
a	,, Crystals	per ton	£3	..
a	Sodium Bichromate, casks ..	per lb.	2½d.	..
a	,, Cyanide	per lb.	7d.	..
	METALS, &c.			
b	Aluminium Ingots, in ton lots ..	per ton	£150	..
b	,, Wire, in ton lots ..	per ton	£177	..
b	,, Sheet, in ton lots ..	per ton	£175	..
b	Babbitt's metal ingots	per ton	£43 to £140	..
c	Brass (rolled metal 2' to 12') basis	per lb.	7¾d.	..
c	,, Tube (brazed)	per lb.	9¼d.	..
c	,, ,, (solid drawn).. ..	per lb.	8¼d.	..
c	,, Wire, basis	per lb.	8d.	..
c	Copper Tubes (brazed)	per lb.	10¾d.	..
c	,, ,, (solid drawn) ..	per lb.	11d.	..
g	Copper Bars (best selected) ..	per ton	£84	..

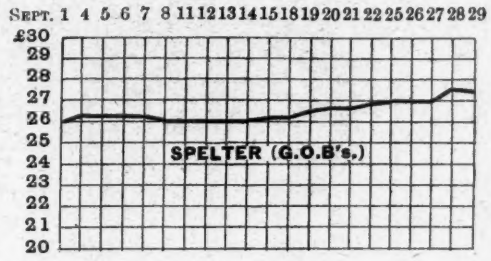
	METALS, &c. *(continued)*.		Latest Price.	Fortnight's Dec. or Inc.
g	Copper Sheet	per ton	£84	..
g	,, Rod	per ton	£84	..
e	,, (Electrolytic) Bars ..	per ton	£77 10	£3 10s. inc.
e	,, ,, Sheets ..	per ton	£90 10	£3 10s. inc.
e	,, ,, Rod ..	per ton	£84 10	£3 10s. inc.
e	,, ,, H.C. Wire	per lb.	9¾d.	¾d. inc.
f	Ebonite Rod	per lb.	8/3	..
f	,, Sheet	per lb.	3/-	..
n	German Silver Wire	per lb.	1/6	..
h	Gutta-percha, fine	per lb.	6/- to 7/-	..
h	India-rubber, Para fine	per lb.	5/5 to 5/5½	2d. dec.
i	Iron, Charcoal Sheets	per ton	£18	..
i	,, Pig (Cleveland warrants)	per ton	51/6	3s. 1d. inc.
i	,, Forgings, according to size	per ton	From £11	..
i	,, Scrap, heavy	per ton	47/6 to 50/-	..
i	,, Wire, galvanised No. 8 ..	per ton	£9 15	..
g	Lead, English Ingot	per ton	£14 17 6	15s. inc.
g	,, ,, Sheet	per ton	£16 10	15s. inc.
m	Manganin Wire No. 28	per lb.	8/-	..
g	Mercury	per bot.	£7 5	2s. 6d. inc.
d	Mica (in original cases) small ..	per lb.	6d. to 1/-	..
d	,, ,, ,, medium	per lb.	2/6 to 4/-	..
d	,, ,, ,, large ..	per lb.	4/6 to 8/6	..
p	Phosphor Bronze, plain castings	per lb.	1/1 to 1/3	..
p	,, rolled bars & rods	per lb.	1/1½ to 1/3	..
p	,, ,, strip & sheet	per lb.	1/4	..
o	Platinum	per oz.	84/-	..
e	Silicium Bronze Wire	per lb.	10½d. to 11¾d.	..
i	Steel, Magnet, acc'd'g to desc'p'n	per ton	£58	..
i	,, ,, in bars		£15 to £40	..
g	Tin, Block	per ton	£148 10' to £149 10	£2 inc.
n	,, Wire, Nos. 1 to 16	per lb.	1/9½	..
p	White Anti-friction Metals— "White Ant" brand.. ..	per ton	£46 to £70	..
j	Yarns, 2/10s Grey Cotton, on sp'ls	per lb.	8d.	..
j	,, 6 lea. Flax	per lb.	5¾d.	..
j	,, 3 ply 10 lbs. Russian ..	per lb.	4 1/16d.	..
j	,, 10 lbs. Russian, single ..	per lb.	4¼d.	..
j	,, 180 lbs. Jute rove ..	per ton	£11	..
k	Zinc, Sh't (Vieille Montagne bnd.)	per ton	£31 5	30s. inc.

Quotations supplied by Messrs.:—*a* G. Boor & Co.; *b* The British Aluminium Co., Ltd.; *c* Thos. Bolton & Sons, Ltd.; *d* F. Wiggins & Sons; *e* Frederick Smith & Co.; *f* India-Rubber, G.P. and Teleg. Works Co., Ltd.; *g* James & Shakspeare; *h* Edward Till & Co.; *i* Bolling & Lowe; *j* Walter H. Hindley and Co., Ltd.; *k* Morris Ashby, Ltd.; *m* W. T. Glover & Co., Ltd.; *n* P. Ormiston & Sons; *o* Johnson, Matthey & Co., Ltd.; *p* The Phosphor Bronze Co., Ltd.

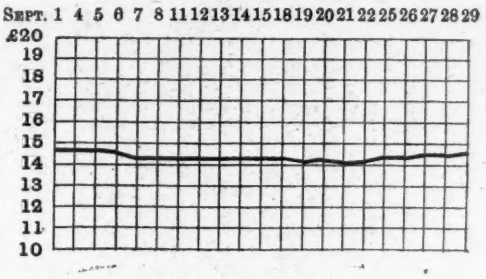
Decomposition of Silver Sulphide in Presence of Mercury.—Writing in *Metallurgie* lately, W. Hinrichsen and T. Watanabe described the results of their investigation into the separation of silver from its sulphide in presence of mercury. Mercury alone throws the metal out of silver sulphide, but in presence of pure water its action is much weaker. In presence of a solution of common salt, however, the reaction is more energetic, and there is a rough proportionality between the strength of the solution and the amount of silver set free. Raising the temperature to 40° C. also exerts a favourable effect. Zinc amalgam is more powerful than pure mercury. Zinc acts electrically upon silver sulphide, showing a potential of 0·965 volt in a 20 per cent. solution of common salt. Iron gives a voltage of only 0·4, and is not competent to throw down the silver. If the common salt is replaced by a solution of potassium cyanide or sulphuric acid, iron is capable of decomposing silver sulphide, but is not so effective as mercury. It is evident that the yield of the amalgamation process depends largely upon mechanical conditions, such as the method of agitation, &c.; the variations being due to differences in the cohesive power of the mercury, which is very different in common salt solution, pure water, dilute sulphuric acid, and potassium cyanide. Since the galvanic action of iron in potassium cyanide solution is very slight (0·16 to 0·01 volt), the increase in the yield obtained with its aid must be brought about by mechanical action.

METAL MARKET.

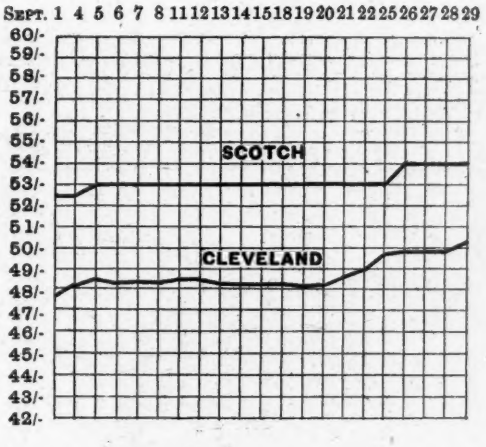
Fluctuations in September.



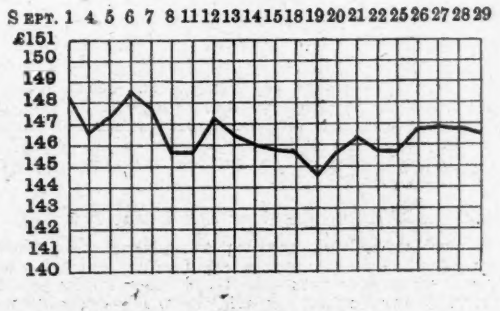
LEAD (ENGLISH)



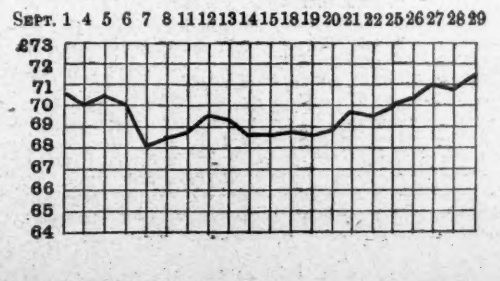
IRON.



TIN.



COPPER (G.M.B's.)



NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

(*Continued from page 527.*)

Artistic Switch-Covers.

Messrs. Waltham & Co., of York Street, Buckingham Gate, S.W., who have been known for many years for the speciality they make of artistic covers for switches, have recently brought out a

Fig. 39.—Waltham Artistic Switch Cover.

number of new patterns, one of which, intended for a room decorated in the style of the Renaissance period, is here illustrated. The range of designs is now so extensive, that Messrs. Waltham devote one of their showrooms exclusively to the display of this branch of their work. The firm has for some time past made a feature of designing covers specially for particular positions or build-

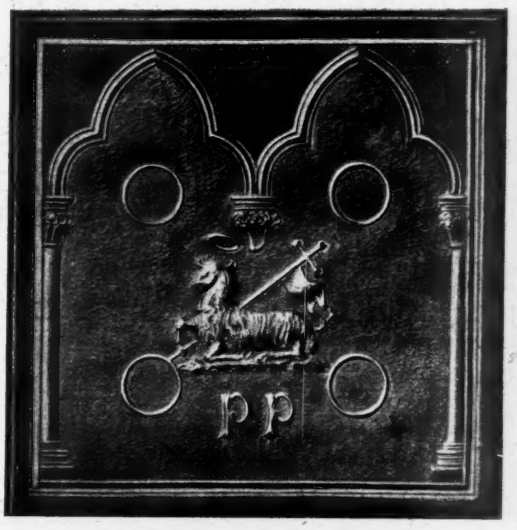


Fig. 40.—Switch Cover for Four Switches.

ings, and the second illustration (fig. 40) represents a cover for four switches, being one of a number they have designed and made for a town hall in the Midlands. The new edition of their switch cover catalogue should prove of use to contractors; it contains copies of some very fine examples of switch covers, plug connections for wall sockets and door furniture, while tables of prices are given at the end.

Lifting Magnets.

Some novelties have been recently developed by the Electrical Co., Ltd., of 121-125, Charing Cross Road, W.C., in the shape of lifting magnets. Owing to the varied purposes to which these may be put, several types have been standardised by the firm which vary in detail according to the work they are intended to perform. They are made suitable for ingots or thick plates having smooth surfaces, the magnets being made in circular or oval form, the latter being especially useful for lifting narrow material, as a greater weight can be thus dealt with than would be otherwise possible.

Another class is devoted to plate lifting, the choice depending upon the number and thickness of the plates to be lifted at one time. The lifting power decreases in proportion to the thickness and number.

In fig. 41 we show the application of the magnets for lifting rails, tees, angles, &c. Material of a variable nature, such as would

be produced in a rolling mill, would be thus dealt with. The degree of unevenness, *i.e.*, the difference of height between the highest and lowest points of the surface, should not exceed 1 in.

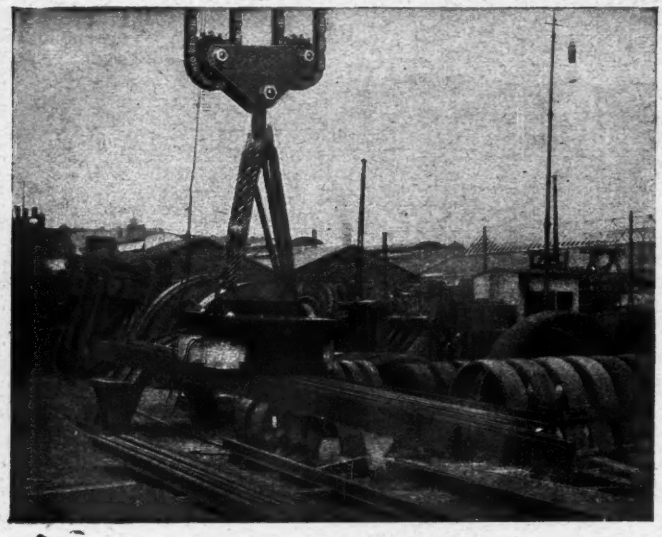


Fig. 41.—Magnet suitable for Lifting Rails, Square or Round Iron Bars.

Yet another purpose for which they are employed is for rough material, such as pig-iron, where the degree of unevenness exceeds 1 in.

Fig. 42.—Square Lifting Magnet with Movable Poles, for lifting Iron or Steel having uneven Surfaces.

All of these magnets are made in various sizes to lift from 7 cwt. up to 3 tons; but, of course, for heavier weights two or more magnets can be used. For the larger magnets, cut-outs with magnetic spark blow-outs and kicking coils are provided.

Wandsworth Switches.

The accompanying illustrations show some selections from the switch manufactures of the "Wandsworth" Electrical Manufacturing Co., Ltd., of 9, St. Paul's Square, Birmingham. Fig. 43 is a high voltage tumbler switch designed by the company's managing director. Its action is controlled by metal parts only, no movement whatever being allowed to take place on the ebonite insulation, which ensures a long life to the switch. Best quality ebonite only is used to insulate the contact arm from the switch handle. We understand that special automatic machinery has been devised in order to secure accuracy in manufacture. Fig. 44 represents a 10-ampere capacity switch which has positive action, but without the disadvantages consequent on moving parts working on insulation. The handle is jointed directly to the contact arm, so

Fig. 43.—5-Ampere H.V. Switch.

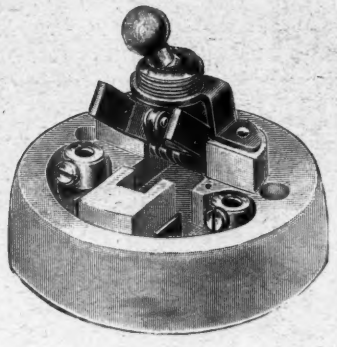


Fig. 44.—10-Ampere H.V. Switch.

that one cannot be operated without the other. The switch is designed to meet the most stringent rules for 250 volts. The insulation is the same as in the fig. 43, which is a five-ampere. Another device illustrated (fig. 45) is a high voltage switch with a patent locking cover arrangement. There is only one loose part (the nut) which jams on the shoulder of the bridge piece and can be removed only by means of a special key. This locking cover places no strain whatever on fittings, as it can be turned round

Fig. 45.—H.V. Switch with Locking Cover.

without in any way loosening the nut. It can be affixed in any position and the nut screwed to the shoulder. The springs in the cover take up any play and make a very simple and effective locking arrangement. It is claimed that in combination with the secret key switch, this a most effectively protected device. Many other interesting specialities appear in the Wandsworth Co.'s priced catalogue, which our readers should consult.

Self-Contained Compensator Alternating Arc Lamp.

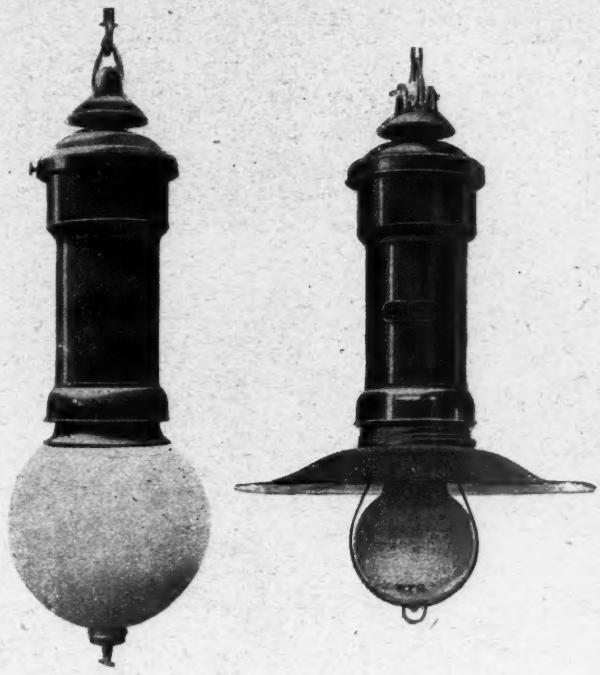
The usual method of operating enclosed alternating current arc lamps on 200-220-volt circuits requires the installation of an external compensator which is suitable for two lamps. This method introduces complications in the wiring, especially where the lamps are required for street lighting, and where one lamp only is required a two-light compensator is still necessary.

The lamp illustrated herewith (figs. 46 and 47) requires no such external device. Each lamp is equipped with a self-contained compensator, which is enclosed within the lamp casing, thus making each lamp an independent unit. The usual reactive coil is also dispensed with, the compensator being so designed as to have sufficient reactance to steady the arc, and it is also adjustable for variations in line voltage. These lamps are designed to operate on frequencies ranging from 50 to 100 cycles.

The efficiency and power factor of this design of lamp are stated to be highly satisfactory, with very steady and noiseless operation.

With tests made with different frequencies for which the lamp is suitable, and with 200 volts at the terminals, the power factor will

range from 0·765 to 0·82, and the efficiency from 83·5 per cent. to 88 per cent. This current from the line will be approximately 3·5 amperes at 200 volts, and the current through the arc will be 7·5 amperes at 72 to 75 volts. A large number of these lamps,



Figs. 46 and 47.—B.T.H. Self-contained Compensator A.C. Arc Lamps.

which are manufactured by the British Thomson-Houston Co., of Rugby, are installed in regular service, and giving satisfaction. The accompanying illustrations show two different styles of lamp, in which the operating devices are identical.

New Stearn Lamps.

Among the new things appearing in the catalogue which has just been published by the Zurich Incandescence Lamp Co., of 47, Victoria Street, S.W., is their heating lamp, which is made with a bulb 10 in. long × 2¼ in. diameter, for use in the various radiators now on the market. We show one of these in fig. 48. The energy consumption is stated to be about 250 watts per lamp. In fig. 49 we illustrate their diffused light lamp, which has been introduced to meet the demand for a large globe lamp without sealing point. It is made in 16 and 32-c.p. sizes, and it can be used with any existing shade, opal or enamelled, or alone. The Stearn special street

Fig. 50.—Stearn Street Lighting Lamp.

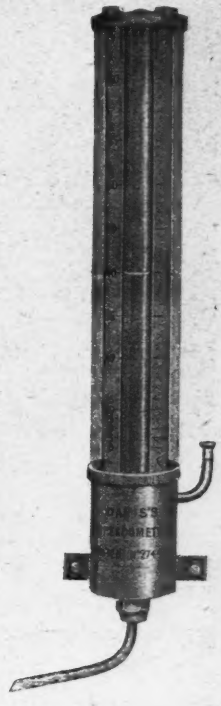
Fig. 49.—Stearn Diffused Light Lamp.

lighting lamp appears in fig. 50. It was originally designed to meet special requirements for Brighton street lighting. It has a large bulb, with consequent reduction of blackening, and a wide spread of filament, and special care is taken in capping, to place the pins of the cap at right angles to plane of filament, so that by careful setting of the holders in street lanterns the wide spread of filament can be arranged to face any desired direction. Other specialities in the new list are tramway, changeable voltage, conical candle, and fancy and miniature shaped lamps. The Zurich lamp factory is at Kew Gardens, London.

Speedometer for Motor Cars.

The speed indicating apparatus illustrated in figs. 51 and 52 (Davis's patent) is supplied by Messrs. John Davis & Son (Derby), Ltd., and is intended to show the speed of engines or motor-cars at a glance. It has only one working part, and that is a small eccentric which

The Pulsator.



The Indicator.

Figs. 51 and 52.—Davis's Speedometer.

carries a short piston rod which actuates a rubber disk, forming one end of an air chamber, and oscillates air over the end of a small air tube, creating a vacuum. The latter varies precisely with the speed of the motor-car. This device may be fitted to existing cars, it being driven by a bicycle sprocket wheel and chain. The

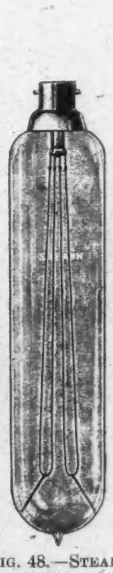
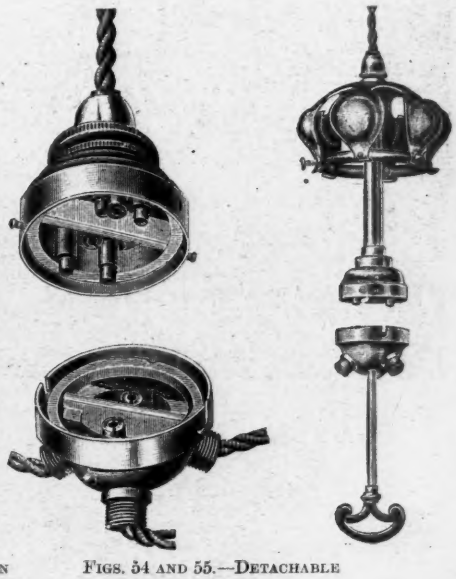


Fig. 48.—Stearn Heating Lamp.



Figs. 54 and 55.—Detachable Ball Fittings. Calderbank Accessories.

indicator is fixed on the splash board, and a coloured light in a well-protected glass tube shows at a glance the speed of travelling in miles per hour. The indicator does not require timing; a small metal or flexilbe pipe connects the pulsator and indicator. The indicators are calibrated to the speed of the driving shaft, and there is no friction gear to slip, no cog gearing, and only one lubricator to require attention. Among Messrs. Davis's other specialities is a rapid sketching device, also the Jackson-Davis double slide rule and the Smith-Davis differential wages calculator, illustrated lists of which will be sent by the firm on application.

Calderbank Accessories.

Mr. Harry W. Calderbank, of 78, King Street, Manchester, is manufacturing a number of patented electrical accessories, some of which we illustrate. Fig. 53 represents the "Premier" high voltage tumbler switch with cover removed, showing "off" position. These switches are made entirely of English porcelain and metal, no fibre or any other semi-insulating material being employed. The switch knob is also of porcelain, thus preventing possibility of electric shock. A long, quick and independent break is among the

Fig. 53.—"Premier" Tumbler Switch.

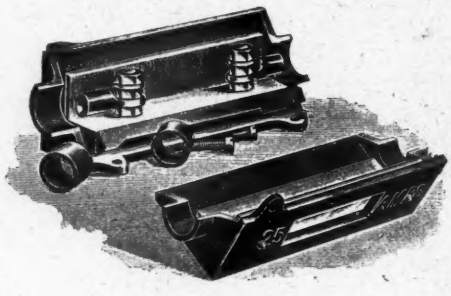


Fig. 56.—House Service Fuse Box.

claims set up for the "Premier." In figs. 54 and 55 (p. 563) are shown the firm's patent detachable ball fittings, by means of which shades can be removed without unwiring lamps. The fittings can be made for any number of lights, and they enable circuits to be broken and remade instantly. Fig. 56 represents a house service fuse box of Calderbank make. The firm purchased the stock and business of Messrs. Clayton & Co., of Union Works, Huddersfield, and is therefore now selling their house switches, a large stock from 15 to 1,000-ampere, single and double-pole, being held.

(To be continued.)

ELECTRICITY IN AMERICAN MINES.

By T. CAMPBELL FUTERS.

(Concluded from page 523.)

The Hampton central power station generates energy for transmission to eight different collieries—viz., the Bellevue and Dodge, the Brisbin, the Cayuga, the Hyde Park, the Pyne, the Sloan, the Diamond and the Archbald. Of these the line to Cayuga is not yet in operation, but the voltage on this line will be higher than in the others, and transformers will be installed for this purpose. The power station is built of brick, and has one main floor and a basement. On the main floor are installed the generating sets, the exciters and the switchboard. In the basement are placed the air pumps for the condensers, the oil pumps for maintaining the pressure beneath the step bearings of the turbines and an oil switch for a heavy current line to a water hoist.

The generating units are four 500-h.p. Curtis turbines, each coupled direct to an alternating-current generator. The turbines run at 1,800 r.p.m. with steam at a pressure of 150 lb. per sq. in., superheated 200° F. The generators are three-phase 60-cycle, 126-ampere machines generating current at 2,300 volts, and this pressure is used on all the lines except that to Cayuga. The machines are placed in a row along one wall of the building. The field excitation is supplied from two 50-kw., 125-volt direct-current generators, each coupled direct to an engine running at 280 r.p.m., with saturated steam at a pressure of 150 lb. per sq. in. Each exciter furnishes current for two alternators.

Outside the building, and directly behind the turbines, are four Worthington barometric condensers, one connected to each turbine. Each turbine exhausts through a tee-piece, the exhaust steam entering at the side and the condensing water at the top of the tee. The condensed steam and water fall through the condenser tube to the basement, where they are removed by an air pump; one air pump taking care of two condensers and maintaining a vacuum of about 28 in.

The method of supporting the steam pipes is interesting, and the writer is not aware that it has been adopted heretofore in this country. They were originally supported upon brick piers, but owing to the settling down of these piers and to vibration in the line, there was some danger of the pipes being ruptured. The piers were accordingly cut down, and a heavy helical spring carrying a chair was placed between the top of each pier and the pipe, the pipe being supported in the chair. This method has proved eminently satisfactory, and no trouble whatever has been encountered with the lines or supports.

Two oil pumps supplying oil to the step bearings of the turbines, are steam driven. Originally, they were driven by continuous-current motors, supplied with energy from the exciters, but as the exciter engines were run with saturated steam, whenever the steam pressure dropped the voltage was lowered, the pump motors slowed down and the oil pressure fell, so that the turbines suffered in consequence. One would have thought, however, it would have been a simple matter to provide some arrangement to cut out resistance inserted in the shunt to maintain the speed constant. A pressure of 300 lb. per sq. in. is maintained underneath the step bearings of the turbines by means of an oil accumulator. The throttle valves of the steam engines driving the pumps are controlled by the accumulator by means of chains and weights. Should the pumps become disabled, the accumulator will keep the pressure at 300 lb. per sq. in. for 5 minutes with all four turbines in operation, or for 20 minutes if only one turbine is running.

The switchboard consists of nine panels of grey marble.

There is a separate panel for the supply to a water hoist—to be presently described—where the water is wound out of the pit instead of being pumped. As about 1,500 kw. at 85 per cent. power factor and 2,300 volts are to be transmitted, the current will be very heavy, and it was considered best to place the oil switch in the basement and break each line in a separate compartment. Accordingly, an electrically operated switch was placed in the basement; each line being in a separate compartment, with a slate floor and a 4 in. brick wall between. The switch is thrown from the switchboard. The leads are encased in lead and run up the sides of the building to the roof, where they are taken out.

A 12-ton travelling hand crane is comprised in the station equipment.

The water hoist before mentioned is about 500 ft. from the power station. As is often the custom in American mines, water, instead of being pumped, is raised by a winding engine in large buckets, special shafts being sunk for this purpose, or separate compartments provided in a large shaft. In this case a shaft 460 ft. deep is sunk, and water is hoisted from this shaft by means of two buckets, or, as they are often called in this country, water cages, suspended by ropes from a hoist tower or headgear over the shaft. Around the top of the shaft has been built a concrete basin into which the buckets are dumped. The headgear is 93 ft. in height, and the buckets are 6 ft. in diameter and 19 ft. 6 in. deep, with a capacity of 17 tons of water. In the bottom of each bucket are two lift gates or valves, with an area nearly equal to the cross-section of the bucket. These valves are lifted automatically when the bucket reaches the top, and the water is discharged through the bottom into a spout fitted below the bucket, which deflects it to either side of the shaft. Each bucket makes a complete round trip in 1 minute 55 seconds, the total lift being 555 ft. The buckets are raised and lowered by means of an 800-h.p. induction motor running at a constant speed of 400 r.p.m., and driving a pair of drums on which the ropes are wound. These drums are conical, in order to obtain a low starting speed (and to counterbalance the weight of the ropes), the two diameters of the drum being 16 ft. and 10 ft. The motor is set at right-angles to the drums, and motion is transmitted to the latter through a friction clutch and bevel gearing. Band-brakes are placed at a number of different points, in order to make a quick stop if necessary. Hitherto it has always been considered necessary either to couple the motor to the winding drum or to drive direct by gearing, and to start and stop the motor each time the bucket or cage reached the surface, and the arrangement described is a radical departure from ordinary winding methods.

The new Nauticoke power station will represent the latest and best practice in the application of power to coal mining, and will generate current for transmission to four collieries. It is designed for an ultimate equipment of five Curtis turbines, though three only are to be installed at present, which will operate with steam at a pressure of 150 lb. per sq. in. and a superheat of 200° F. Each turbine is to be direct connected to a revolving-field three-phase 60-cycle 4,150-volt alternator connected on the four-wire system. The exciters are 75-kw. 125-volt direct current machines. One exciter is to be driven by a 75-kw. Curtis turbine, and the other by a 75-kw. 440-volt induction motor. Energy will be transmitted to the various collieries without transformers, at a voltage of 4,150.

The boilers are of the Babcock & Wilcox water-tube type, fitted with the same firm's superheaters. They are to be hand fired; fitted with Parsons stationary pin-hole grate bars, and designed to burn refuse from the collieries of a size not larger than barley. The ashes, however, will be removed by mechanical means operated by motors.

The power generated is to be transmitted to the following collieries: the Auchinloss, the Bliss, the Tonesdale, and the Avondale. At the Auchinloss, about three miles distant, the shaft is 1,700 ft. deep. The high voltage wires will run directly down this shaft to the motors. In this mine the seams are at an angle of 45°, and the full tubs will be hauled up the inclines by induction motors. The hauling machines are close together, and one bank of transformers will be used for all the motors. There will be three 200-kw. transformers for stepping down the line pressure of 4,150 volts to 240 volts for the motors. A 50-h.p. 440-volt induction motor will also be used to drive a two-stage centrifugal pump with a capacity of 700 gallons per minute against a head of 190 ft.

In the breaker will be installed a 50-h.p. 500-volt direct-current motor operating a tub hoist, and 13 other motors for various purposes at 275 volts. Current is supplied to these by a rotary converter and three 110-kw. transformers.

At the Bliss Colliery, distant about 3½ miles, a 300-kw. rotary converter will furnish direct current at 500 volts, on the two-wire system. This converter will be used in connection with two direct-current generators which are already installed. The current will be used to operate two hauling machines in the mine as well as six

locomotives at present in use, and some additional ones which are to be purchased. Inside the mine a hoist will be driven by a 200-H.P. induction motor operating at 440 volts. Another 40-H.P. induction motor will drive a centrifugal pump lifting 1,000 gallons per minute against a head of 100 ft. The pressure will be stepped down by transformers in the mine.

At the Tonesdale Colliery part of the supply current will be converted to direct-current at 275 volts. When the breaker is fully equipped, however, over 50 induction motors will be installed. For these the line voltage will be stepped down to 440 volts. Inside the mine will be a six-stage 700-gallon centrifugal drainage pump working against a head of 600 ft., driven by a 150-H.P. induction motor. At the Avondale Colliery a 300-KW. 550-volt rotary converter will be running on the three-wire system. There will also be a 500-volt 100-H.P. motor driving a vertical shaft centrifugal pump, with a capacity of 2,500 gallons per minute against a 90-ft. head.

The special features to be noted in the above installations are the tendency to the use of high voltage three-phase currents, and the adoption of induction motors. To quote the article:—"The use of these (induction motors) was decided upon on account of the economy of copper. The shafts in some cases are 1,700 ft. deep, and the motors are often located 3,000 to 4,000 ft. away from the base of the shaft. . . . Another feature of the use of the induction motor in the mine is the absence of sparking. . . . This is a minor feature, however, as the engineers of the company state that the high tension wires might easily be broken by the falling of the roof of the mine, thus causing a spark which would ignite any gases present." This latter statement is important, as the adoption of induction motors is not, in the writer's opinion, a panacea for all the dangers due to the introduction of motors into a colliery. The trouble in nearly all cases of accident (except the overloading and burning of armatures) has been with the cables and connections.

It is also to be noted that the current is transmitted from the newer Nauticoke station at about twice the pressure at which it is transmitted from the Hampton station. All the transformers, however, have been so wound that at any time they can be used at the higher voltage, so that eventually current can be obtained from either station, or the equipment made uniform in the generating stations if desired. The article concludes with the following summary:—"At 18 stations and collieries there are installed a total of 22 generators, with a combined capacity of 4,498 KW. There are five rotary converters with a combined capacity of 850 KW. The company operates, or has ordered, 56 electric locomotives of various horse-power, the total horse-power being 3,950. In the different mines there are installed 21 electrically-operated hoists, operated by 28 motors with a total capacity of 1,915 H.P. There are 23 motor-driven pumps, the motors having a capacity of 1,571 H.P., in addition there are 24 other motors for miscellaneous uses having a total capacity of 318 H.P."

"The use of electricity in this industry has proved so successful that its further extension will probably be rapid. This is shown by the improvements which the Lackawanna Co. is making, and also by the installation of electricity in the mines of companies which heretofore have used other motive power, such as compressed air, steam or animal power."

Whilst the development of electricity in English collieries is steadily proceeding, yet no separate colliery company has gone so far as to put down a central power station on similar lines to the Lackawanna Co., though the electrification of the Lambton Collieries may be taken as an indication that British coalowners are alive to the fact that considerable economy is to be derived from such a course. What strikes one is the number of electric locomotives in use, and considering the thousands of horses and ponies, and the disadvantages and expense attending their employment in the mines in this country, it seems strange that electric haulage has not been more largely adopted here. No doubt the conditions in American mines are more suitable to the employment of the locomotive, but it is an easy matter to fix a small motor and drum and haul by rope; in many instances locomotives could be adopted, as it must be remembered that before a horse can be got into the pit, the workings must be sufficiently high or top stone must be taken down to make the road high enough for him to travel. Compared to the cost of installing and operating electrical haulage, the cost of animal power is exorbitant.

ELECTRICITY v. GAS FOR PUBLIC LIGHTING.

So much prominence has lately been given in the daily papers to the action of the Corporation of London and one or two other municipal bodies in substituting gas for electricity for street lighting, and so much capital has been made by the various gas companies out of these occurrences, that we feel called upon to inquire into the causes which have led to such changes being made.

That such cases have occurred it would be folly to deny, but we are convinced, and hope to prove conclusively, that nowhere has the change been justified either by considerations of cost, or better illumination.

Let us, in the first place, state exactly what has happened in the City of London.

As some of our readers may remember the Brush Co., some 13 or 14 years ago, erected a number of open-type arc lamps for lighting the streets of the City. The lamps were fitted inside lanterns similar to those which are still used in most places for gas; that is to say, of the upright design, so made that most of the light is lost by being sent out above the horizontal, and the rays which might have been made use of are, to a great extent, lost in the shadow of the post and the base of the lantern.

To make matters worse, the lanterns are glazed with crinkled glass, which greatly obscures the light. Of course, at the time these lanterns were first used, people were not accustomed to anything else, and it was perhaps natural that the old-fashioned design should have been adhered to. Now in 1891, an agreement was entered into between the City of London Electric Lighting Co. and the Corporation, by which the latter body was to be charged £26 per lamp per annum for current upkeep, &c., the company to provide the lanterns and arcs, which were to be supplied from a special plant.

The object of using a separate plant was to give the Corporation the opportunity of acquiring the same if at any time it thought fit. The agreement thus entered into was, after much legal antagonism, held to be invalid on the ground of some of the councillors holding shares in the supply company, but the arrangements for electric lighting continued in force notwithstanding. Under such conditions of uncertainty it was hardly to be expected that the company, when the arc lamps and lanterns became obsolete, would go to the expense of replacing them and bringing them up to date. Hence a system of arc lighting, which is capable of very great improvement, has continued in use up to now, and the Corporation, acting up to the traditions of municipal bodies, has set itself to compare the effect of the best modern gas light with that of an antiquated arc lamp of an obsolete lantern.

It was understood recently that the company would be invited to tender for an up-to-date installation, but without giving them the opportunity of so doing, the City authorities decided, at a cost of some £2,000, to substitute as an experiment 112 incandescent gas lamps for the 74 arcs in Queen Victoria Street, part of Queen Street and Fleet Street.

It is thus clear that the change that is being made is only in the nature of an experiment, and cannot by any stretch of the imagination be regarded as a case of gas superseding electricity as the result of a fair comparison between the best examples of each illuminant.

The unfortunate part of it is, that this has not been made clear in the daily papers, and the man-in-the-street is led to the conclusion that gas, after all, is better and cheaper than electricity for public lighting, and hence, by inference, for interior lighting also.

It is, therefore, of paramount importance that electrical men should do all in their power to prove the fallacy of these conclusions. No more fitting time could be found to enlighten the public in this matter than the present, when there is so much to be seen at Olympia demonstrating the superiority of electricity over its rivals.

It is not surprising, under the circumstances, that some of the smaller municipalities should be led astray by the example set by their London *confrères*, and it is a fact that more than one municipality has decided on reversion to gas. Two cases in particular have recently come before our notice, namely, Banbury, and the Pemberton division of Wigan. As we have not the details before us, we are not in a position to state why the councillors in these two towns contemplate superseding electricity by gas.

In Banbury there are only two arcs, three Nernst and four incandescents, so the public electric lighting can only be regarded as an experiment. The announcement that reversion to gas is definitely decided on is not accurate, as the matter is still under consideration by the Council and the supply company.

At Pemberton, wild statements have been made to the effect that the public lighting by electricity has proved much more expensive than when gas was used. As there are at Pemberton 22 arcs as well as incandescents, it is not at all clear on what basis the comparison is made. If the streets were formerly dimly lit by incandescent gas, and are

now brilliantly lighted by arc lamps, it seems hardly fair to make a direct comparison on the basis of cost, without taking into consideration the better illumination. Other cases might be cited, where electricity has had to give way to gas for the lighting of streets, but we know of none in which the change has been effected as a result of any definite comparative tests of the rival illuminants.

Be that as it may, the fact remains that there are towns where electricity is being ousted by gas from the field of public lighting, and such cases will continue to occur and increase in number unless energetic and systematic steps are taken by station engineers and others to educate the public mind to a proper appreciation of the undoubted advantages of electricity for this purpose.

On looking through the lists of electricity supply works which we publish every year, it can hardly fail to strike one what a large percentage of towns, many of them of considerable importance, have no street lighting load at all, or practically none. Take the case of Birmingham. Here we have a flourishing commercial city of the first rank, with not a single public electric lamp. The case is, perhaps, a peculiar one, since the gas undertaking has for many years been in the hands of the municipality, and has been worked up into a very strong position; whereas the electricity supply was only taken over in 1900. The latter has, therefore, a very powerful rival to contend with. Yet one would think that during these five years some attempt would have been made at least to experiment with arc lamps in the principal thoroughfares.

The best lights in Birmingham at present are vertical lanterns fitted with five ordinary incandescent mantles, on posts about 12 to 15 ft. high, and the effect in large squares and important streets is gloomy in the extreme. Many towns, it is true, have arcs in the more important streets, but those in which electricity has superseded gas for side street lighting as well, form, in our opinion, a much smaller percentage than they reasonably ought to do. We are convinced that this state of affairs is not due to our illuminant being inferior to, or dearer than, gas, but that it is in many cases owing to its superiority not having been brought home to the public mind.

We admit that there are many towns where the gas interest is so strong in the Council that any attempt to introduce electricity is well nigh hopeless. But we maintain that there are also many towns where the authorities have an *almost* unbiased mind (not quite unbiased, perhaps, for there is an inherent aversion in the mind of the average Councillor to anything in the nature of a change), and in such places one ought to be able to argue with some success on the basis of "I can give you more light than you are getting now for less money than you are at present paying."

We have stated that in those cases in which gas has been reverted to no comparative tests have been taken of the merits of the rival illuminants, and we contend that had such tests been duly taken and their results used as a guide for future action, gas would not have been used in place of electricity. In the valuable report drawn up by Mr. Fedden for the Corporation of Sheffield, some very interesting and instructive figures are given which help to bear out our statement. He uses as a basis of comparison the candle-foot, which he defines as the lighting effect observed with normal eyesight on a surface illuminated by one standard candle burning at a distance of 12 in. from that surface. He publishes figures obtained from a series of tests taken at Sheffield on Lucas lamps and flame arc lamps. To quote from the report in question :—

"The illumination of the arc lamp at a distance of 120 ft. was ·17 of a candle-foot, whilst at a distance of only 100 ft. the illumination of the gas lamp was too low to be measured, and consequently *estimated* at ·09 of a candle-foot."

The following figures from the same source speak for themselves :—

	Illuminating power. Arc. C.P.	Gas. C.P.	Cost per 1,000 C.P. Arc. d.	Gas. d.
Nominal	5,000	2,100	·354	·467
Mean actual. Calculated from all the observations up to 80 ft.	2,694	1,202	·657	·816
Calculated from the observations at 60, 70 and 80 ft.	2,590	1,154	·684	·850

Here is an extract from Mr. Pearce's report to the Manchester Corporation :—

"Comparing the cost of production for street lighting, as between 'arcs' and the 'intensified gas,' I take the last figure furnished me by the gas department for the latter method, which is at the rate of 1·08d. per 1,000 C.P.-hours. I believe this figure also includes 10 per cent. for depreciation.

"*Gas.*—At 4,000 hours of burning. Degree of illumination equivalent to 1,000 C.P. Cost = 4,000 × 1·08d. = £18.

"*Electricity.*—Under the same conditions as above. Number of units used = 4,000 × 7/10 = 2,800. 2,800 × 0·95d., £11 1s. 6d.; carbon and trimming, 8s.; depreciation 10 per cent., £1 3s. 1d. Cost = £12 12s. 6d. Equivalent to 0·75d. per 1,000 C.P.-hours.

"I have taken the same figure for depreciation for comparison."

"From calculations made I find that the costs of illumination in Albert Square and Sackville Street work out as follows :—

Albert Square Arcs.

Consumption, 600 watts per hour.
Mean candle-feet (M.C.F.), taken from curves = 2·03.
Board of Trade units per M.C.F. per hour = 600/2·03 × 1,000 = 0·295,
Which at 0·95d. per B.T.U. = 0·28d.
Cost per M.C.F. per hour for arcs = 0·28d.

Sackville Street Intensified Gas.

Cost of production, 1·08d. per 1,000 C.P.-hours,
Equivalent to 0·565d. per 525 C.P.-hours.
Mean candle-foot taken from curves = 1·43d.
Cost per M.C.F. per hour for gas = 0·565d./1·43d. = 0·395d.

"The above calculations, as far as they affect the 'arcs,' are based on actual measurements taken on the site. These results are based on the results of working of the past few months, and are, therefore, reliable, and there is only one conclusion to be drawn, viz. :—

"*That the electricity department can carry out a system of street lighting that compares more than favourably with the 'intensified gas system,' both from the point of view of annual cost and illuminating effect.*"

In Mr. Bradley's report on the Westminster Street lighting, he gives as the result of tests extending over a period of 18 months a number of useful figures. One column in this report gives the average *total* cost per candle-power per annum including all tests. The lowest gas figure under this column was for Sugg high-pressure lamps, Parliament Square, and the lowest for electricity was for Westminster arcs in Muranese globes. The former figure was 9·85d. and the latter 8·7d. The arcs in question, it should be noted, were not of the most modern type, and doubtless with the best flame arc lamps this figure would have been materially less.

One other test may be cited as showing the advantage electricity has over its rivals both as regards lowness of cost and superiority of illumination.

Mr. Wedding, in a paper read before the Cologne Electrical Society, gave the following figures as the cost in pence per 1,000 C.P. for various typical forms of lighting :—

	Cost in pence per 1,000 candle-hours.
Oil, kerosene lamp	10·5d.
Gas, Welsbach mantle	3·4d.
Gas, "Lucas"	2·4d.
Gas, high pressure incandescent	2·25d.
Electric, flame arc lamp	1·15d.

All the foregoing figures show conclusively the advantage of arc lamps over gas on the ground of economy. Where a powerful light is necessary, the arc, without a doubt, is the cheapest per unit of illuminating power, as well as being the most powerful one known. For side streets a smaller lamp is often sufficient, and here electricity is again well to the fore. For this purpose the best example the gas people can show is an ordinary incandescent mantle using from 3½ to 4 cb. ft. of gas per hour.

Lamps fitted with one mantle will give approximately			40 C.P.
" " "	two mantles	" " "	70 "
" " "	three	" " "	100 "

These candle-powers may be taken as representing the effect of new, or nearly new, mantles, but as is well known after a few weeks' use, or after a flaw caused by wind or vibration, the candle-power is very much less.

For each 4 ft. mantle we would use a ½-amp. Nernst lamp, which will give about 70-C.P. when new. This lamp also falls off in illuminating power, but at its lowest ebb it is not so bad as an old mantle, and vastly better than a damaged one.

Mr. Henry Joseph, in a paper published by us last year,* gave figures showing the comparative yearly costs of gas and ½-ampere Nernst lamps. Taking an average for 71 towns of the cost of gas, lighting and extinguishing, repairs, and maintenance, but excluding capital charges, he obtained a figure for 4,000 hours burning of £3 12s. 6d. per lamp per annum.

His estimate for ½-ampere Nernst lamps, deducting capital charges, was £2 2s. 6d. This figure is based on a current cost of ·75d. per unit. This, the writer argues, leaves a wide margin for profit and competition. That is to say, an average price is obtainable which, while showing a reasonable profit, is still much lower than the average price charged for gas.

In a report recently submitted to the Croydon Council on the subject of street lighting, comparative figures are given of the cost of electric and incandescent gas lamps. The average cost per C.P. per annum of 90 electric lamps (Nernst and incandescent) is given as 13·71d., while the corresponding figure for 2,137 incandescent gas lamps is 15·862d.

The advent of the tantalum lamp opens up further prospects for electricity as a rival to the incandescent mantle for side street lighting.

The efficiency of this lamp is about the same as the Nernst lamp, and it appears to possess the great advantage that it does not fall off very greatly in C.P. after prolonged use.

This is greatly in its favour, since, apart from considerations of cost, it is in this direction that an improvement on the Welsbach mantle is looked for.

If experience with this lamp confirms the claims that are being made on its behalf, a very powerful weapon with which to fight the gas interest will be placed in the hands of central station engineers.

In considering comparative figures of the cost on the basis of C.P. of the two illuminants, it must be borne in mind that several other items go to make up the total yearly costs.

In most of these electricity shows to advantage. In the cost of lighting and extinguishing we have in the one case lamplighters' wages and uniforms, and in the other, interest and depreciation on whatever apparatus is necessary for controlling a number of lamps from a central point. The mere fact that such apparatus are used at all for electric lamps is in itself sufficient proof of the fact that on this point electricity again scores. It must not be forgotton that in order for a lamplighter to light his lamps by the time it is dark, he has to start while it is still light, usually about an hour too soon. In the same way gas lamps are also left on longer than is necessary when the time comes to extinguish them. With electric lamps centrally controlled there is no waste from this cause.

Where gas lamps burn for about 4,000 hours per annum, this means an increase of about 10 per cent. in the cost of gas.

With flame arc lamps as a competitor to high pressure gas lamps, the cost of recarboning is very small in comparison to the cost of replacing mantles and attending to burners. With Nernst lamps as against gas mantles, the cost of renewals is about the same in both cases, but the cost of cleaning globes is negligible with the former as compared to the latter.

We have endeavoured to show that electricity is not only the best, but also the cheapest illuminant for public lighting. We believe that its advantages cannot be too frequently or too forcibly demonstrated to those who have charge of municipal affairs.

There may be towns where electricity holds the field, and where dissatisfaction exists either on the score of cost or illumination or both.

In such places it is well for the advocates of electricity to inquire whether it would not pay them to improve the light or lower the cost, for even at the smallest profit every endeavour should be made to keep a street lighting load where it exists, or to extend it where electricity has got a footing. For besides the value of public lighting as a load factor, it is of immense importance as an advertisement. The *man-in-the-street* frequently draws his deductions as to the merits of our illuminant for indoor purposes from its effectiveness out of doors. Shopkeepers in a well lit thoroughfare will not be content with badly lit windows, the atmosphere of businesslike smartness which is imparted to a street lighted by arc lamps is infectious, and tradesmen will adopt electric light to keep abreast of the times.

Where electricity has not yet got a footing for public lighting, every endeavour should be made by those responsible, to demonstrate its effectiveness.

In many towns a start has been made by erecting free of charge a couple of arc lamps in some public place, and after a few months' ocular demonstration submitting a price for a permanent installation.

Public lighting has in many towns been lost by trying to obtain too high a price. Estimates for side street lighting have been based on the cost of running ordinary incandescent lamps. We do not believe that there are many places where carbon filament lamps can successfully compete with incandescent gas.

A few arc lamps judiciously placed will enable many small gas lamps to be done away with altogether.

We are well aware, as we have already stated, that in many places the personal element as a factor in the consideration of this question is such as to practically preclude all possibility of electricity entering the arena. We know of a town not 100 miles from London where the electricity supply company offered to take over the whole of the public lighting for a fixed annual sum about £1,000 less than is at present being paid for gas and attendant costs. All high candle-power lamps were to be replaced by arc lamps, and all incandescent burners by electric lamps of higher candle-power. This offer was curtly refused.

It is hardly necessary to add that the town council was largely composed of shareholders in the gas company.

* Electrical Review, May 13th, 1904.

THE TRIUMPH OF IGNORANCE.

Not a day too soon comes the Olympian Exhibition, if signs from the provinces are to be accepted. Too often lately we have had to record instances of gas replacing electricity in public buildings, or of gas being preferred in new buildings. Why is this?

Are there any new facts in the gas world, or have the many claims of electricity been exploded after such prosperous years? Have the people who decide these matters become suddenly enlightened as to the superior merits of gas light through proofs of which we have no inkling?

Perhaps answers to these questions will come as we describe briefly how the Guardians of the Stourbridge Union arrived last week at their decision, by 25 votes to 11, to light their new work palace with gas.

Over 1,000 lights were in question, so that an adverse vote affects the electrical industry quite appreciably in a direct way, while the indirect effect might be considered much more serious if we were not confident that unsound arguments and clouded figures can never do much permanent damage.

The workhouse is on the route of the high-tension mains of the Midland Power Co., and we gather from the reports in the local papers (on which we have had to rely for our information throughout) that a flat rate of 2½d. per unit was offered by this company.

The Guardians also obtained tenders through their architect for an isolated generating plant, including wiring and fittings, and for the necessary work and fittings for gas lighting. For the latter two tenders were sent in, one from an independent private firm, the other from the gas department of the Stourbridge U.D.C. Here we have a flagrant instance of rate-aided competition, and one which is not tempered by the fact that four guardians who voted in the majority are also members of the Stourbridge Council.

Without knowing something about the specification, we cannot say that it was vague, but the tenders for the electric lighting plant were so varied that if this was not so, then the tenderers must have used their own discretion to such a degree that no true comparison could be made. They run as follows:—(1) £2,446, (2) £2,402, (3) £2,010, (4) £1,725, (5) £950, (6) £875, and these sums include "about £400" for telephones, electric bells, tell-tales and wiring.

However discrepant they are, it does not appear that any revisions were placed before the board, whereas the two gas tenders were originally £1,828 and £1,898, which might be reduced to £1,350 (Stourbridge gas works) and £1,750 respectively *if the tenderers' specifications were accepted.* [But] no particular attention seems to

have been paid by the members to any of these tenders, either for electric light or gas, the discussion centring on the comparative lighting bills, with electricity at 2½d. and gas at 2s.

Then it was that the gas people obscured everything with statements as to the consumption of gas per candle-power, so that every member who ventured on an estimate of the gas bill discovered new and better figures as the discussion proceeded. The manager of the Stourbridge Gas Works informed the clerk to the Guardians that an incandescent burner took 4 to 5 ft. per hour, while correspondence in the local papers, which of course played an important part in the business, induced certain speakers to use the figure of 1 ft. per 16 c.p. as a basis for comparative speculation; so between the vague uncandled former statement, and the too definite latter, any Guardians who really tried to hold the balance true became involved most hopelessly in the intricacies of simple arithmetical problems set by past masters in the art.

On the most favourable showing, it appeared that electricity at 2½d. per unit was several times dearer than gas at 2s. The most extraordinary thing about the debate was the entire ignorance of everyone as to the real average consumption of incandescent mantles, although we suppose that all had perpetual opportunities in their own houses to obtain figures which would either uphold or dash to the earth the soaring claims of the gas men. And, again, no one seemed to remember that the gas per candle-power or per lamp per hour was given as for new mantles, even though all who have incandescent burners in their houses must have grumbled many a time at the rapid decrease in candle-power, the actual increase of gas per lamp as this ageing proceeds, and the increasing brittleness and early destruction of the mantles themselves.

Nor was it suggested by any speaker that the claims of the gas men of "more light per lamp" were unsound. Comparison was being made between a number of 16-c.p. and 8-c.p. electric lamps and an equal number of gas burners for which as much as 40 to 60 c.p. was claimed. As we say, it was not suggested by any speaker that this high candle-power, if ever attained, is a thing of a moment only, a fleeting brilliancy which gives place before a dozen hours are past to a semi-incandesced surface, throwing out sickly green rays and poisonous fumes into the living rooms.

One gentleman settled the question for himself, if not for those to whom he spoke, by expressing his emphatic conviction that paupers ought to be content with the light with which the Guardians themselves illuminated their dwellings; another squashed the enlightened lady member, who urged the greater comfort, cleanliness and indirect economy of electric light, by remarking that he supposed the rooms would have to be limewashed once a year anyhow; while a third quoted a professor of the Birmingham University to prove that the atmosphere of public buildings was fouler with electric than with gas light.

The last objection to electricity adds a new weapon to the gas armoury. The foul air of most public buildings after supporting a crowd for a few minutes is a scandalous fact for architects to controvert and explain, and many a building depends for the circulation of pure and ejection of befouled air on the heating action of gas flames.

Take away the gas, and partial suffocation ensues. The means of ventilation are meant to last as long as the building, and when electric light supersedes the gas lamps, the motive force of the ventilating system vanishes, and is replaced by nothing else.

It is possible to conceive buildings in which the expense incident on reorganising the system of ventilation would make the adoption of electric light an extravagance, but we cannot object too strongly to new buildings, in which the most modern ventilating methods should be incorporated, being condemned to the perils and inconveniences which are inseparable from gas lighting, because in the old days the production of exhausted air was used as a means to induce pure air. The problems of lighting and ventilation must be solved independently, and there was no evidence in the speeches of the most violent pro-gas guardians that the architect had forgotten this fact.

The assertion that the fire insurance companies offered the lowest rates for electrically lighted buildings had no apparent effect on the meeting, but no contradiction was essayed.

In this age of constant improvements it is manifestly unfair to compare lights on the basis of 4½ watts per candle for electric lamps. Here we have in millions the Nernst lamp at 2½ to 3 watts, and the tantalum at under 2, while the carbon filament lamp itself has been ashamed for some time to own to more than 4, and is being brought down to a level 3 by the introduction of new processes.

Notwithstanding common knowledge, the battle of the lights at the Stourbridge Workhouse was fought and won on the old, old assumption of the maintenance of initial candle-power throughout the life of an incandescent mantle, on claims for economy in gas consumption which cannot be upheld, and on the use of out-of-date electric lamp efficiencies.

One thing we must add, that the guardian who upheld the standard of electricity against overwhelming odds, with at least as much intelligence and knowledge as any on that side, was a lady.

In a year's time we shall expect to hear something more of this local controversy, when the "true bill" has been disclosed, and the Guardians have to explain why it is so much heavier than their amateur estimates. Meanwhile, we congratulate the Stourbridge gas department upon the acquisition of so valuable a consumer.

Dover Tramways.—On Monday Mr. George Wyndham, M.P., inaugurated the new municipal electric tramway service from Dover to River by driving the first car on the route.

NEW PATENTS APPLIED FOR.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

18,790. "Improvements in method and apparatus for producing electricity." H. E. Fry. September 18th.

18,793. "Improvements in or relating to systems of electrical distribution for lighting and other purposes." C. N. Staniland and O. P. Macfarlane. September 18th.

18,813. "Improvements in or relating to electrolytic electricity meters." The Bastian Meter Co., Ltd., and C. O. Bastian. September 18th.

18,814. "Electric incandescence lamp with filament of metallic tungsten." W. P. Thompson. (Deutsche Gasglühlicht Aktien-Gesellschaft, Auer Gesellschaft, Germany.) September 18th. (Complete.)

18,822. "Improvements in and relating to electro-magnetic apparatus for producing reciprocating motion." F. Fanta. September 18th.

18,832. "Improvements in or relating to sparking plugs for internal combustion engines." A. J. Boult. (L. Macquaire, France.) September 18th. (Complete.)

18,846. "Improvements in the control of electric motors." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) September 18th.

18,847. "Improvements in prepayment electric time switches." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) September 18th.

18,488. "Improvements in prepayment meters." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) September 18th.

18,852. "A combined automatic adjusting apparatus and lubricating axle, for use on trolley heads of electric cars and the like." H. Niblett. September 18th. (Complete.)

18,875. "An improvement in the construction of pendant bracket and standard fittings for gas, oil and electric lighting." T. Ford and F. Ford. September 19th.

18,886. "Improvements in electric percussive tools." F. D. Johnson and H. S. Potter. September 19th.

18,904. "Improvement connected with electric switches." G. Smith. September 19th.

18,909. "Improved method of electric welding." A. F. Rietzel. (Date applied for under Patents Act, 1901, February 24th, 1905, being date of application in United States.) September 19th. (Complete.)

18,927. "Improvements relating to safety devices for use with overhead electrical conductors." A. V. Millet. September 19th.

18,943. "An improved automatic device for controlling electric circuits, lamps and the like for electric signs and the like." C. Adams and W. Chancellor. September 20th.

18,972. "An improved electric lamp." A. Bourdos and M. Lorenz. September 20th.

19,007. "Improvements in electrical resistances." A. H. Atteridge and The British Submarine Boat Co., Ltd. September 20th.

19,015. "Improvements in or relating to apparatus suitable for use in the distribution of electric current." A. F. Berry. September 20th.

19,034. "Improvements in wireless telegraphic apparatus." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) September 20th.

19,035. "Improvements in insulating material." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) September 20th.

19,036. "Improvements in systems of electric metering." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) September 20th.

19,059. "Improvements in or in connection with the trolley poles of electric tramcars and like vehicles." A. Adams. September 21st.

19,092. "Improvements in reciprocating electric engines." B. O. Wagner. (Date applied for under Patents Act, 1901, September 22nd, 1904, being date of application in United States.) September 21st. (Complete.)

19,099. "Improvements in and relating to automatic transmitters for electric telegraphy." W. Judd, A. Fraser and A. R. Hardie. September 21st.

19,111. "Improved method of and ingredients for the manufacture of a substance suitable for electrical insulation." C. Hess. September 21st.

19,116. "A new or improved machine for electrically soldering metal wires, cables, hoop-irons and the like." L. S. Rolland. September 21st. (Complete.)

19,125. "Improvements in electropathic wearing apparel." J. A. Romain and S. S. Anidjah. September 21st.

19,129. "Improvements in sparking plugs for internal combustion engines." R. H. N. Lindley and J. B. King. September 21st.

19,138. "Improvements in and relating to dynamo-electric machines." The Allgemeine Elektricitats-Gesellschaft. (Date applied for under Patents Act, 1901, September 22nd, 1904, being date of application in Germany.) September 21st. (Complete.)

19,153. "Improvements in starting switches for electric motors." T. E. Weaver. September 22nd.

19,210. "Improvements in protective devices for electric distribution systems." The British Thomson-Houston Co., Ltd., and E. B. Wedmore. September 22nd.

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